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Hepatitis C infection and other drug-related harms among inpatients who injected drugs in Turkey

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Abstract

Hepatitis C virus (HCV) is easily spread among those who share drug injection equipment. Due to the ease of contraction and growing prevalence of HCV in Eastern Europe, the aims of this study focused on describing risky injection practices as well as the prevalence of HCV, HIV and hepatitis B virus (HBV) among people who inject drugs (PWID) who were admitted to public and private drug treatment centres in Turkey from 2012 to 2013. Other aims included identifying correlates of needle sharing and HCV infection. Of the 4694 inpatients who ever injected drugs and the 3914 who injected in the past 30 days, nearly all (98%) reported heroin as their drug of choice, the vast majority reported ever sharing a needle (73.4% and 79.3%), and the mean age at first injection was 23 years. Of current PWID, 51.9% were HCV-positive, 5.9% were HBV-positive and only 0.34% of lifetime PWID were HIV-positive. Predictors of increased needle sharing include younger age, being unemployed, having lesser education and reporting heroin as a drug of choice. Significant predictors of HCV infection included being 40 years or older, receiving treatment in the Mediterranean region of Turkey, reporting heroin as a primary substance, a longer duration of drug use and sharing needles. With this information, it is essential to improve access to clean injection equipment in Turkey, to focus on improving education on clean injection practices and to enhance efforts in testing and treating HCV-positive PWID.

KEYWORDS
hepatitis C virus, injection drug use, needle sharing, Turkey

1 | INTRODUCTION

Injection drug use (IDU) has been increasing in prevalence globally, with particular growth recently observed in Europe, Central Asia and the Middle East.[1-3] IDU is associated with a variety of risky behaviours, like sharing used needles and other injection equipment. With these practices comes the heightened chance of contracting corelated harms, especially that of the hepatitis C virus (HCV) infection.[2,4]

Besides simply sharing needles, studies report that HCV can also be spread via injection paraphernalia (e.g. cookers, spoons and cotton filters) as well as through back-loading (drawing blood into a syringe before injecting) and drawing drugs from the same bag with syringes.[5-8] Such ease of transmission exacerbates the spread of HCV, even when needle exchange programmes may exist. In fact, HCV is transmitted 10 times more efficiently than HIV when intravenous practices are present.[9] Of all new HCV cases, 80% occur among people who inject drugs (PWID), and with the continued growth of IDU across populations, HCV rates are expected to increase well into the future.[2,3] High HCV rates are also important indicators that may foreshadow future HIV

Abbreviations: HBV, hepatitis B virus; HCV, hepatitis C virus; IDU, injection drug use; PWID, people/person who inject(s) drugs; PWUD, people/person who use(s) drugs.

epidemics given the similarity of the risky behaviours and injection practices of PWID that spread both infections.[1,10]

Treatments for HCV infection among people who use drugs (PWUD) do exist worldwide; however, most are underfunded and service uptake is low, thereby leading to a substantial burden of HCV-related morbidity and mortality among PWUD, including liver failure and related complications.[2,11] It is approximated that 10 million PWID are HCV-positive, which is 3.5 times higher than the number of PWID who are HIV-positive.[5,12] Currently, global HCV prevalence has been estimated at 67% among PWID, with countries in the Mediterranean and Eastern European regions reporting approximately 23 million HCV infections.[13]

Areas in the Mediterranean and Middle East have easy access to drugs like opium and heroin because of their general proximity to the readily available and thriving drug markets of certain nations like Afghanistan, which contributed to about 88% of the world's opium supply in 2005.[1] In particular, Turkey has become a frequent crossroad destination between Europe and Asia, as well as between Russia and the Middle East.[14] Turkey acts as a middleman for the transit of drugs, with its border to the Black Sea and proximity to the Caspian Sea ports—both locations increasingly utilized for the transport of illegal drugs.[14] Furthermore, recent research suggests that IDU is common among PWUD in Turkey, with increases in heroin use and transition to injecting at a younger age as observed in a recent analysis of data among treatment-seeking PWUD in Turkey.[15] However, current information on the prevalence of HCV among PWID in Turkey is lacking.[16,17] Therefore, it is imperative to understand the characteristics and injection practices of PWID in Turkey and whether HCV and other similar infectious disease rates for Turkish PWID resemble levels seen in other nations.

Turkey does not have a standardized national policy regarding HBV and HCV screening and referral to care, leaving many PWID to seek treatment on their own.[18] Inpatients at the 22 facilities for Research, Treatment and Training Centers for Alcohol and Drug Addiction (AMATEM) must receive mandatory testing for HCV, HBV and HIV. However at the outpatient level, mandatory testing does not exist. AMATEMs only use the enzyme-linked immunosorbent assay (ELISA) screening for HCV and all tests must be sent out of the facility for confirmation, thus leading to a delay in confirming the inpatient's status. Further, AMATEM facilities are limited to only testing and do not offer additional treatment. For those who do seek testing and treatment for HCV, HIV and HBV, all patients must have their name registered and all files are of open access.[18] Turkey's lack of patient confidentiality, minimal referral mechanisms and absent screening policies may lead to a combination of issues like low levels of treatment, fear of stigmatization and exacerbation of viral comorbidities among Turkish PWID.

The objectives of this study were to describe the risky injection practices as well as the prevalence of HCV, HIV and HBV among PWID admitted for inpatient drug treatment in Turkey's AMATEMs and other private addiction treatment centres. The other aim includes identifying the correlates of needle sharing and HCV infection so as to better understand the risky practices among PWID in Turkey and their contribution to the spread of HCV. The information will assist in improving treatment and creating tiered preventative measures for PWID that focus on halting the transmission of related comorbidities.

2 | MATERIALS AND METHODS

2.1 | Study participants

All male and female individuals of Turkish nationality who reported ever injecting drugs and who were admitted to inpatient substance use treatment at one of 22 public treatment centres (AMATEMs) or at private clinics in Turkey in 2012 or 2013 were included in this study.[15] For the purposes of this paper, the treatment centres and private clinics were grouped by location into seven geographic regions in Turkey: Marmara (including Istanbul, Bursa and Edirne), Aegean (including Izmir, Manisa and Denizli), Mediterranean (including Antalya, Adana and Mersin), Central Anatolia (including Ankara, Konya and Kayseri), south-east Anatolia (including Gaziantep and Diyarbakir), Black Sea Region (including Samsun) and East Anatolia (including Elazig).

2.2 | Measures

Information about socio-demographic characteristics and drug use behaviours was voluntarily obtained in private rooms and with informed consent from all individuals upon intake into the AMATEM or private clinic. Socio-demographic characteristics included gender, age, number of years of education, living conditions (alone, with family, with friends, in a foundation or homeless) and employment status (regular job, temporal employee, unemployed or other). Information at intake was gathered with a modified format of the European Monitoring Center for Drugs and Drug Addiction's Treatment Demand Indicator 2.0 Questionnaire.[15,19]

History of drug use and current drug use behaviours was also obtained, including age at first use, frequency of use in the past month and preferred route of administration (injection, smoking, inhaling and eating or drinking) for up to three drugs, including the respondent's primary substance. Drug types included heroin, other opioids (e.g. meperidine, morphine), cocaine, cannabis, synthetic cannabis (e.g. bonzai), club drugs (e.g. ecstasy, ketamine, methamphetamine), prescription medications (e.g. alprazolam, diazepam, zolpidem) and inhalants (e.g. glue, paint thinner). From this information, we identified individuals who had used multiple types of drugs in the past month. We also calculated each individual's duration of drug use based on the minimum age of first using any reported substance. Information was obtained about whether the individual had received drug treatment in any treatment centre previously.

Individuals who reported ever having injected a drug were questioned about their age at first injection, whether they had ever shared a syringe and whether they had injected and shared a syringe in the past 30 days. Finally, individuals were tested for hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) by ELISA; samples were sent out to separate testing laboratory facilities. For a small number of lifetime and current PWID (n=217 and

n=196, respectively), infection test results were not available; these individuals were excluded from further analyses.

2.3 | Analyses

We first examined the socio-demographic characteristics, drug use behaviours and previous treatment history of the individuals who had ever injected drugs and of those who had injected in the past 30 days. The prevalence of HBV, HCV and HIV infection was also calculated in each group, along with 95% confidence intervals. Subsequent analyses were restricted to current PWID with known infection status. In particular, we evaluated the relations between the aforementioned individual characteristics and sharing syringes in the past 30 days, as well as HCV infection, using chi-square tests as well as logistic regression analyses to assess bivariable relations, and multiple logistic regression analyses to assess adjusted relations, including all predictors that were at least marginally significant (*P*-value<.10) in bivariable analyses. The number of HIV-positive PWID was too small to allow for a detailed assessment of the correlates of HIV infection in this population.

3 | RESULTS

In total, 4694 of 11 247 individuals admitted for inpatient drug treatment in Turkey in 2012-2013 reported having ever injected drugs, with 3914 (83.4%) of those having injected in the past 30 days. Table 1 shows the characteristics of lifetime and current PWID, who were mostly male, aged 18-29 years, living with family and unemployed. Nearly all (98%) reported heroin as their primary substance and their mean age at first injection was 23 years; all PWID reported using their primary substance every day in the past 30 days. Finally, the vast majority reported ever sharing a needle (73.4% of lifetime and 79.3% of current PWID).

Prevalence estimates for HBV, HCV and HIV infection are shown in Table 2. The prevalence of HBV infection was 6.2% among lifetime PWID (95% confidence interval [CI]=5.5-6.9%) and 5.9% among current PWID (95% CI=5.1%-6.6%), whereas around half of the sample was positive for HCV (47.1% of lifetime PWID, 95% CI=45.6%-48.5%; 51.9% of current PWID, 95% CI=50.3%-53.5%). HIV infection was quite rare, with only 15 cases among lifetime PWID, corresponding to a prevalence of 0.34% (95% CI=0.17%-0.50%). Regarding comorbidity between infections, among lifetime PWID who were HBV-positive, 50.4% were also HCV-positive; among those who were HIV-positive, 53.3% were also HCV-positive. However, the vast majority of those with HCV infection (93.1%) were not co-infected with HBV or HIV.

Among current PWID, 55.8% reported sharing a needle in the past 30 days. As shown in Table 3, predictors of needle sharing in bivariable analyses included age (*P*<.001), employment status (*P*<.001), education level (*P*<.001), region (*P*<.001), location of drug treatment (*P*=.005), heroin as preferred drug (*P*<.001), duration of drug use (*P*=.046) and use of multiple types of drugs in the past month (*P*=.014). Including all marginally significant predictors together in a multiple logistic regression model yielded the following statistically

TABLE 1 Socio-demographic characteristics, drug use behaviours and treatment history of injection drug users receiving inpatient drug treatment in Turkey, 2012-2013

	Ever injected drugs n=4694		Injected drugs in past 30 days n=3914	
	n	%	n	%
Socio-demographic characteristics				
Gender				
Female	216	4.6	155	4.0
Male	4478	95.4	3759	96.0
Age				
11-17 years	122	2.6	89	2.3
18-29 years	3246	69.2	2763	70.6
30-39 years	1045	22.3	858	21.9
≥40 years	281	6.0	204	5.2
Mean age (SD)	27.2 (7.0)		27.0 (6.6)	
Living situation				
Alone	173	3.7	150	3.8
With family	4448	94.8	3707	94.7
With friends	20	0.4	18	0.5
Charity	40	0.9	27	0.7
Homeless	13	0.3	12	0.3
Employment				
Regular job	1285	27.4	1062	27.1
Temporal employee	163	3.5	147	3.8
Unemployed	3125	66.6	2621	67.0
Unknown	121	2.6	84	2.2
Education				
No formal schooling	109	2.3	97	2.5
1-5 years	1388	29.6	1177	30.1
6-8 years	1868	39.8	1546	39.5
9-12 years	1080	23.0	894	22.8
>12 years	249	5.3	200	5.1
Region				
Marmara	1607	34.2	1225	31.3
Aegean	199	4.2	158	4.0
Mediterranean	2544	54.2	2268	58.0
Central Anatolia	248	5.3	180	4.6
South-east Anatolia	3	0.1	3	0.1
Black Sea Region	18	0.4	16	0.4
East Anatolia	75	1.6	64	1.6
Location of treatment				
Private clinic	149	3.2	120	3.1
Public treatment centre (AMATEM)	4545	96.8	3794	96.9

(Continues)

TABLE 1 (Continued)

	Ever injected drugs		Injected drugs in past 30 days	
	n=4694		n=3914	
	n	%	n	%
Drug use behaviours				
Drug of choice				
Heroin	4589	97.8	3835	98.0
Other opiates	92	2.0	72	1.8
Other drugs[a]	13	0.3	7	0.2
Mean age at first drug use (SD)	20.6 (5.1)		20.6 (5.0)	
Duration of drug use				
≤ 2 years	487	10.4	411	10.5
3-5 years	1554	33.1	1274	32.6
6-9 years	1342	28.6	1157	29.6
≥ 10 years	1311	27.9	1072	27.4
Used multiple drug types in past month				
No	3181	67.8	2591	66.2
Yes	1513	32.2	1323	33.8
Mean age at first injection (SD)	23.0 (5.6)		22.9 (5.5)	
Ever shared needles				
No	1248	26.6	811	20.7
Yes	3446	73.4	3103	79.3
Shared needles in past 30 days				
No	2518	53.6	1738	44.4
Yes	2176	46.4	2176	55.6
Treatment history				
Previous drug treatment				
No	1770	37.7	1468	37.5
Yes	2924	62.3	2446	62.5

[a]Other drugs include cannabis, synthetic cannabis and prescription medications.

a temporal employee (aOR=1.63, 95% CI=1.10-2.43) or unemployed (aOR=1.22, 95% CI=1.05-1.43), both compared to having a regular job; having less education (aOR=3.82, 95% CI=2.16-6.76 for those with no formal schooling, aOR=2.01, 95% CI=1.44-2.81 for those with 1-5 years of schooling, aOR=1.93, 95% CI=1.39-2.68 for 6-8 years and aOR=1.59, 95% CI=1.13-2.23 for 9-12 years, all compared to more than 12 years of schooling); receiving drug treatment in a public treatment centre (aOR=1.60, 95% CI=1.05-2.44, compared to a private clinic); and reporting heroin as one's drug of choice (aOR=4.83, 95% CI=2.42-9.64). Receiving treatment in the Aegean (aOR=0.36, 95% CI=0.25-0.53) or Central Anatolia (aOR=0.58, 95% CI=0.42-0.81) regions of Turkey was associated with a decreased risk of needle sharing in the adjusted model (compared to the Marmara region).

Table 4 presents the correlates of HCV infection among current PWID. Socio-demographic characteristics, drug use behaviours and previous drug treatment history were all significantly associated with HCV status in bivariable analyses. In a multiple logistic regression model, significant predictors of HCV infection included being 40 years of age or older (aOR=2.48, 95% CI=1.32-4.65, compared to 11- to 17-year-olds); receiving treatment in the Mediterranean region of Turkey (aOR=3.21, 95% CI=2.72-3.79, compared to the Marmara region); reporting heroin as one's primary substance (aOR=2.35, 95% CI=1.27-4.36); longer duration of drug use (aOR=1.49, 95% CI=1.15-1.93 for 3-5 years, aOR=1.70, 95% CI=1.30-2.23 for 6-9 years and aOR=2.26, 95% CI=1.67-3.05 for 10 or more years, all compared to 2 years or less); sharing needles in the past 30 days (aOR=1.99, 95% CI=1.72-2.30); and having received drug treatment previously (aOR=1.97, 95% CI=1.70-2.29). Living with friends (aOR=0.18, 95% CI=0.04-0.88, compared to living alone) and using multiple drug types in the past month (aOR=0.77, 95% CI=0.65-0.92) were both associated with a decreased risk of HCV infection in the adjusted model.

4 | DISCUSSION

In this study of inpatients receiving drug treatment in Turkey, more than half of individuals who had injected drugs in the past 30 days reported needle sharing and were found to be HCV-positive. Correlates of needle sharing included younger age, lack of employment and lower education, whereas correlates of HCV infection included older age, longer duration of drug use and needle sharing.

TABLE 2 Prevalence of HBV, HCV and HIV infection among injection drug users receiving inpatient drug treatment in Turkey, 2012-2013

	Ever injected drugs			Injected drugs in past 30 days		
	n=4477[a]			n=3718[a]		
	n	%	95% CI	n	%	95% CI
Infection status						
HBV-positive	276	6.2	5.5, 6.9	219	5.9	5.1, 6.6
HCV-positive	2107	47.1	45.6, 48.5	1930	51.9	50.3, 53.5
HIV-positive	15	0.34	0.17, 0.50	14	0.38	0.18, 0.57

[a]Restricted to those with known infection status.

significant predictors of an increased risk of needle sharing in the past 30 days: younger age (adjusted OR [aOR]=2.12, 95% CI=1.19-3.79 for 11- to 17-year-olds, aOR=1.74, 95% CI=1.23-2.46 for 18- to 29-year-olds, both compared to those 40 years of age or older); being

TABLE 3 Correlates of needle sharing in the past 30 days among current injection drug users receiving inpatient drug treatment in Turkey (n=3718)[a]

	Shared needles in past 30 days						
	n	% shared needles	*P*-value	Unadjusted OR	95% CI	Adjusted OR	95% CI
Total	2073	55.8					
Socio-demographic characteristics							
Gender							
Female	76	51.7	.313	1.00	Ref	–	–
Male	1997	55.9		1.19	0.85-1.65	–	–
Age							
11-17 years	54	62.8	<.001	2.48	1.47-4.18	2.12	1.19-3.79
18-29 years	1546	58.3		2.06	1.52-2.77	1.74	1.23-2.46
30-39 years	396	50.0		1.47	1.06-2.02	1.26	0.89-1.77
≥40 years	77	40.5		1.00	Ref	1.00	Ref
Living situation							
Alone	69	50.7	.544	1.00	Ref	–	–
With family	1973	55.9		1.23	0.88-1.74	–	–
With friends	7	43.8		0.76	0.27-2.14	–	–
Charity	16	59.3		1.41	0.61-3.27	–	–
Homeless	8	66.7		1.94	0.56-6.75	–	–
Employment							
Regular job	503	50.1	<.001	1.00	Ref	1.00	Ref
Temporal employee	85	66.9		2.02	1.37-2.98	1.63	1.10-2.43
Unemployed	1439	57.5		1.35	1.16-1.56	1.22	1.05-1.43
Unknown	46	56.1		1.28	0.81-2.01	1.57	0.97-2.55
Education							
No formal schooling	69	75.0	<.001	5.30	3.04-9.26	3.82	2.16-6.76
1-5 years	653	58.8		2.52	1.83-3.47	2.01	1.44-2.81
6-8 years	842	57.4		2.38	1.74-3.25	1.93	1.39-2.68
9-12 years	440	51.4		1.87	1.35-2.59	1.59	1.13-2.23
> 12 years	69	36.1		1.00	Ref	1.00	Ref
Region							
Marmara	629	53.2	<.001	1.00	Ref	1.00	Ref
Aegean	45	28.9		0.36	0.25-0.51	0.36	0.25-0.53
Mediterranean	1294	60.7		1.36	1.18-1.57	1.14	0.97-1.34
Central Anatolia	74	41.1		0.61	0.45-0.84	0.58	0.42-0.81
South-east Anatolia	3	100.0		n/a	n/a	n/a	n/a
Black Sea Region	4	25.0		0.29	0.09-0.92	0.43	0.13-1.44
East Anatolia	24	48.0		0.81	0.46-1.43	0.79	0.44-1.41
Location of treatment							
Private clinic	46	42.6	.005	1.00	Ref	1.00	Ref
Public treatment centre (AMATEM)	2027	56.2		1.73	1.17-2.54	1.60	1.05-2.44
Drug use behaviours							
Heroin as drug of choice							
No	10	13.7	<.001	1.00	Ref	1.00	Ref
Yes	2063	56.6		8.21	4.20-16.05	4.83	2.42-9.64

(Continues)

TABLE 3 (Continued)

	Shared needles in past 30 days						
	n	% shared needles	*P*-value	Unadjusted OR	95% CI	Adjusted OR	95% CI
Duration of drug use							
≤ 2 years	208	53.3	.046	1.00	Ref	1.00	Ref
3-5 years	664	54.6		1.05	0.84-1.32	0.99	0.78-1.26
6-9 years	652	59.3		1.27	1.01-1.61	1.21	0.94-1.55
≥ 10 years	549	54.3		1.04	0.82-1.31	1.18	0.90-1.55
Used multiple drug types in past month							
No	1341	54.3	.014	1.00	Ref	1.00	Ref
Yes	732	58.6		1.19	1.04-1.36	1.01	0.86-1.18
Treatment history							
Previous drug treatment							
No	767	55.9	.859	1.00	Ref	–	–
Yes	1306	55.7		0.99	0.86-1.13	–	–

[a]Restricted to those with known infection status.

Currently, HCV studies on high-risk groups in Turkey, specifically PWID, are significantly lacking as most past HCV epidemiological analyses focused on blood donors and recipients before 1990, when there was no routine blood screening programme for blood donations.[16,17] With new transfusion and donation regulations, HCV has been on a steady decline in Turkey, leading to a relative absence of data on HCV among others at-risk groups.[16,17] However, the high rate of HCV observed among our sample, and the fact that HCV is generally asymptomatic for a portion of time, indicates that HCV is of critical concern among PWID in Turkey.

Hepatitis C virus was identified in 47.1% of the patients who ever injected drugs and 51.9% of those who injected in the past 30 days. This prevalence of HCV surpasses HCV estimates in Afghanistan (36.6%), Saudi Arabia (37.7%) and New York City (42-52%).[1,20,21] However, studies in cities of Pakistan and Iran both report higher HCV rates, where approximately 80% of PWID are positive with HCV.[10,22,23] These elevated rates, which are nearly double that of Turkey's, are notable as Pakistan and Iran are border nations to Afghanistan, where some of the largest production of opiates in the drug market occurs. Pakistan receives approximately 40% of the opiates that Afghanistan produces and Iran accounted for 25% of the world's heroin seizures in 2012.[24,25] Turkey, although further from Afghanistan, is part of the drug trafficking route and may be foreshadowing a mirrored growth of HCV rates to those of Pakistan and Iran.[26]

Hepatitis C virus among PWID has been found to be more globally prevalent than HIV.[12] HIV prevalence among our sample was relatively low, with 0.34% HIV-positive patients and 50.4% of the HIV-positive patients comorbid with HCV. This disparity highlights the greater efficiency of HCV transmission either through injection or through its associated equipment and practices.[27] Other Middle East and North African (MENA) nations have mirrored these disparities between HCV and HIV.[28] Similarly, in Lebanon, HCV positivity in a cohort of PWID was approximately 25% and HIV less than 1%.[29] In a study conducted in the city of Herat, Afghanistan, approximately 56% of PWID in the cohort were HCV-positive and only 18% HIV-positive.[30]

Hepatitis B virus prevalence was 6.2% for those who ever injected drugs and 5.9% for those who injected in the past 30 days. These estimates are similar to other HBV prevalence estimates observed among PWID in Afghanistan (6.5%) and Iran (4.2%).[1,31] Since 1998, Turkey has introduced HBV vaccination into its national immunization campaign.[32] As of 2011, approximately 96% of 1-year-old children received the necessary three doses of the HBV vaccine.[18] Importantly, since 1998, Turkey has offered free testing and vaccinations for at-risk populations like PWID.[32,33] It is notable that Afghanistan has a similar rate of HBV among PWID to that of the inpatients in our data, but (6.5% vs 6.2%) Afghanistan, unlike Turkey, does not currently implement a comprehensive national HBV vaccination programme.[34,35] This comparable HBV rate to Afghanistan may indicate that Turkish PWID are either not accessing or knowledgeable of the benefits of free HBV vaccinations.

Predictors for needle sharing among the sample included being of younger age, being less educated and being either unemployed or a temporal employee. Inpatients aged 29 or younger were more likely to share needles and such findings have been supported from other studies on PWID.[36–41] Some studies hypothesize that needle sharing in younger cohorts may be more frequent because they are either recent initiates that may rely on others to assist in injecting or have strong social networks that encourage sharing needles.[36,41,42]

Being either unemployed or not having the means to afford clean needles has proven to be associated with sharing needles in several studies.[43–45] In Turkey, needle exchange programmes are not available; however if someone is motivated to utilize clean needles, they can purchase new syringes from pharmacies. Having available clean syringes is a positive step forward, but one must consider potential stigma by

TABLE 4 Correlates of HCV infection among current injection drug users receiving inpatient drug treatment in Turkey (n=3718)[a]

	HCV-positive						
	n	% HCV+	*P*-value	Unadjusted OR	95% CI	Adjusted OR	95% CI
Total	1930	51.9					
Socio-demographic characteristics							
Gender							
Female	56	38.1	<.001	1.00	Ref	1.00	Ref
Male	1874	52.5		1.79	1.28-2.52	1.09	0.75-1.59
Age							
11-17 years	30	34.9	<.001	1.00	Ref	1.00	Ref
18-29 years	1325	50.0		1.87	1.19-2.93	1.21	0.73-2.01
30-39 years	452	57.1		2.48	1.56-3.95	1.48	0.87-2.54
≥40 years	123	64.7		3.43	2.01-5.85	2.48	1.32-4.65
Living situation							
Alone	84	61.8	.001	1.00	Ref	1.00	Ref
With family	1825	51.7		0.66	0.47-0.94	0.72	0.48-1.08
With friends	2	12.5		0.09	0.02-0.41	0.18	0.04-0.88
Charity	11	40.7		0.43	0.18-0.99	0.77	0.28-2.18
Homeless	8	66.7		1.24	0.36-4.32	1.19	0.30-4.66
Employment							
Regular job	498	49.6	.007	1.00	Ref	1.00	Ref
Temporal employee	69	54.3		1.21	0.84-1.75	0.77	0.51-1.14
Unemployed	1333	53.2		1.16	1.00-1.34	1.04	0.88-1.22
Unknown	30	36.6		0.59	0.37-0.94	0.76	0.43-1.35
Education							
No formal schooling	56	60.9	<.001	2.07	1.25-3.43	1.24	0.72-2.16
1-5 years	644	58.0		1.83	1.34-2.50	1.33	0.94-1.87
6-8 years	733	49.9		1.33	0.98-1.80	1.27	0.91-1.78
9-12 years	415	48.5		1.25	0.91-1.72	1.34	0.95-1.90
>12 years	82	42.9		1.00	Ref	1.00	Ref
Region							
Marmara	437	37.0	<.001	1.00	Ref	1.00	Ref
Aegean	55	35.3		0.93	0.66-1.32	1.05	0.72-1.55
Mediterranean	1357	63.7		2.99	2.58-3.46	3.21	2.72-3.79
Central Anatolia	56	31.1		0.77	0.55-1.08	0.84	0.59-1.20
South-east Anatolia	3	100.0		n/a	n/a	n/a	n/a
Black Sea Region	6	37.5		1.02	0.37-2.83	1.33	0.41-4.26
East Anatolia	16	32.0		0.80	0.44-1.47	0.61	0.32-1.15
Location of treatment							
Private clinic	54	50.0	.687	1.00	Ref	–	–
Public treatment centre (AMATEM)	1876	52.0		1.08	0.74-1.59	–	–
Drug use behaviours							
Heroin as drug of choice							
No	15	20.6	<.001	1.00	Ref	1.00	Ref
Yes	1915	52.5		4.28	2.42-7.58	2.35	1.27-4.36

(Continues)

TABLE 4 (Continued)

	HCV-positive						
	n	% HCV+	*P*-value	Unadjusted OR	95% CI	Adjusted OR	95% CI
Duration of drug use							
≤ 2 years	129	33.1	<.001	1.00	Ref	1.00	Ref
3-5 years	569	46.8		1.78	1.40-2.26	1.49	1.15-1.93
6-9 years	598	54.4		2.41	1.89-3.07	1.70	1.30-2.23
≥ 10 years	634	62.7		3.39	2.65-4.34	2.26	1.67-3.05
Used multiple drug types in past month							
No	1231	49.9	<.001	1.00	Ref	1.00	Ref
Yes	699	55.9		1.28	1.11-1.46	0.77	0.65-0.92
Shared needles in past 30 days							
No	691	42.0	<.001	1.00	Ref	1.00	Ref
Yes	1239	59.8		2.05	1.80-2.34	1.99	1.72-2.30
Treatment history							
Previous drug treatment							
No	556	40.6	<.001	1.00	Ref	1.00	Ref
Yes	1374	58.5		2.07	1.81-2.37	1.97	1.70-2.29
Infection status							
HBV-positive							
No	1811	51.8	.459	1.00	Ref	–	–
Yes	119	54.3		1.11	0.84-1.46	–	–
HIV-positive							
No	1923	51.9	.886	1.00	Ref	–	–
Yes	7	50.0		0.93	0.32-2.65	–	–

[a]Restricted to those with known infection status.

pharmacists and customers as well as an inability to afford clean needles, because unemployment is a predictor for needle sharing.[38,46,47]

Needle sharing is one of the strongest predictors seen in our study for increased likelihood of HCV. This practice appears to be of high prevalence in our study with 59.8% of HCV-positive patients sharing dirty needles. For those who had shared needles in the past 30 days, the risk for HCV was nearly two times higher than for those who had not recently shared needles. Further, studies have shown that when PWID discover they are HCV-positive, they often do not change their needle sharing habits or other risk behaviours to lessen the potential of spreading the disease.[48–50]

Although younger populations exhibited a greater odds of needle sharing, being of older age (≥40 years old) was a predictor of HCV positivity in our study. For patients at or older than 40 years of age, 75% reported using drugs for ≥10 years, while those aged 11 to 29 predominantly reported drug use duration of 5 years or less.[15] Research has shown that the duration of IDU and older age lead to a greater risk for the contraction of HCV.[36,39,51] In one study in Afghanistan, with each year of injection drug use, there was a significantly increased risk for HCV (OR 4.72), while the year at first injection was not associated with infection.[38] Similar to our study, the median duration of injection for HCV-positive PWID was nine years in San Diego.[37] This contrast in the association between age with needle sharing and HCV status may be attributed to the fact that younger populations do not have as long of a duration of IDU that has exposed them to various comorbidities like that of HCV.[36,42]

Further, there were regional differences in rates of HCV with the Mediterranean region reporting the highest prevalence of HCV, with adjusted odds of HCV over three times that of the Marmara region. This coincides with a previous study in Turkey on PWUD, where IDU was highest in the Mediterranean region.[15] This observation is not consistent with a report on HCV among other risk groups in Turkey, in which HCV prevalence among sex workers and haemodialysis patients was found to be highest in the eastern and south-eastern regions of Turkey.[16]

Our study's findings are subject to several limitations. First, due to the cross-sectional nature of the study, we cannot infer temporality between the correlates and HCV infection. Due to the small size of HIV-positive patients among the sample, we were also unable to assess predictors of HIV. Further, data are not available on other potential predictors like the history of incarceration, other risk behaviours associated with infection transmission (e.g. sexual risk behaviours and sharing of injection paraphernalia besides syringes) and infection status and injection practices among the inpatient's peers, sex partners and families. This limits our ability to fully identify other characteristics associated with needle sharing and HCV contraction among this

sample. Lastly, the data cover only inpatients admitted to AMATEMs and some private centres. This information may not adequately represent the entirety of PWUD and PWID in Turkey.

5 | CONCLUSION

Despite these limitations, our study indicates that HCV infection is widespread among PWID in Turkey, yet HIV is still not frequent among this vulnerable population. HCV, HIV and HBV infection among PWID is an imperative public health dilemma, especially in Middle Eastern and Eastern European nations that have easy access to injectable drugs but lack investment in HCV treatment. To allow for a greater understanding of the transmission of HCV among Turkish PWID, it would be advisable to modify intake questions at these treatment facilities to include information on the sharing of equipment and loading practices.

Although needles can be bought at pharmacies in Turkey, there is an additional need for clean needles to be offered as a public service, free of charge at AMATEMs and private clinics. Further, clean injection equipment (like that of cookers and spoons), besides just that of needles, should be offered free of charge, as such equipment contributes to the HCV epidemic. Future policy endeavours and interventions should also focus on access to clean equipment, not solely that of needles. However, because Turkey does not currently condone needle exchange programmes, it is essential that harm reduction education programmes for PWUD are widespread and well adopted. Drug treatment is an essential time to provide education about safe injection practices that range from emphasizing on clean needle use to sanitizing other injection equipment. Mandating educational activities on safe injection and communicable diseases during treatment, both at an outpatient and inpatient level, would be beneficial in mitigating risk behaviours among PWUD.

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CONFLICT OF INTEREST

No conflict declared.

ETHICAL APPROVAL

The study was approved by the institutional review board at the Turkish Ministry of Health in Ankara, Turkey.

AUTHOR CONTRIBUTIONS

Arash Alaei and Kamiar Alaei led the research, structured questionnaires, provided overall writing guidance and assisted in editing the drafts. Katherine Waye worked alongside Melissa Tracy in writing the drafts of the paper and preparing the manuscripts. Melissa Tracy and Marine Nalbandyan conducted the statistical analyses. Elif Mutlu and Mustafa Kemal Cetin compiled and prepared the data for dissemination and assisted as translational aids and edited the final document. All authors have contributed to and approved the final article.

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