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Original Article

# The Seroepidemiology of Hepatitis C Infection in Drug Abusers Referring to Shiraz Drug Rehabilitation Centers

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## ABSTRACT

***Background:***
Drug abusers are one of the most at risk populations for hepatitis C virus (HCV) transmission worldwide. The aims of this study were to measure the seroprevalence of HCV and to compare certain related risk factors in participants who were referred to drug rehabilitation centers affiliated to Shiraz University of Medical Sciences, Shiraz, Iran.

***Materials and Methods:***
Blood samples and interviews containing questions about age, sex, level of education, house status, jobs, history of imprisonment and psychiatric problems, age at the first drug and first intravenous (IV) drug uses, safe and unsafe sexual activity, and time and duration of IV drug use in the past 30 days were obtained from 1116 participants in rehabilitation centers. The sera were tested for anti-HCV antibody using enzyme immunoassay. The data were analyzed using independent samples t test and one way ANOVA for quantitative variables and Chi-square and Fisher's exact tests for qualitative variables.

***Results:***
Among the 844 participants who agreed to blood sampling, the prevalence of HCV infection was 14.2%. The significant positive associations were detected between anti-HCV antibody positivity and higher levels of education ($p = 0.008$), no history of imprisonment ($p < 0.001$), having a job ($p = 0.006$), having a partner ($p < 0.001$), and higher age at the first drug use ($p < 0.001$).

***Conclusion:***
The seroprevalence of HCV infection among drug abuser was very high in comparison with the general population of Iran. Making policies to prevent transmission of HCV infection among this high risk subpopulation is highly recommended.

***Keywords:*** Drug abuser, Hepatitis C virus, Seroepidemiologic study, Education

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## INTRODUCTION

Hepatitis C virus (HCV) is an enveloped, single-stranded RNA virus with positive polarity (1). It is a major blood-borne infection worldwide, with a silent epidemiology (2) and high direct and indirect economic burden (3). Approximately 3.2 million individuals in the United States are chronically infected with HCV (4). Considering the high prevalence of HCV in the world, it is critical to study the prevalence of this viral infection in each population and also in some high risk subpopulations such as patients

with hemophilia, imprisoned individuals, and addicts.

The incidence of this blood borne virus has declined in the past 2 decades (5), but high risk subpopulations have still more risk factors to be infected by HCV. High risk populations are individuals who are at risk of contracting hepatitis C, including those who come from medically underserved and minority communities and/or have a history of intravenous (IV) drug injection, alcohol abuse, or multiple sexual partners (6). For instance, Shamsdin and colleagues reported that the seroprevalence of HCV infection in patients with hemophilia in Fars province of Iran was 8.9% (7). Also, in developed countries, HCV predominantly infects people who inject drugs (8). Indeed, in the United States, similar to other countries, there is an ongoing epidemic of HCV infection among young adult IV drug users (9).

It has been reported that drug use can be resulted in exposure to HCV (10) and each exposure may cause transmission (11). About 80% of HCV exposed individuals develop chronic infection. 3-11% of those with chronic HCV infection will develop liver cirrhosis within 20 years, with associated risks of liver failure and hepatocellular carcinoma (12). The prevalence of HCV in drug abuser has been reported in some provinces of Iran such as Hamedan (13), Tehran (14), Zanjan (15), and Khuzestan (16). But, there are no reports from Fars province and south of Iran.

Because high risk populations are individuals most at risk of HCV infection, including those who are medically underserved, or have a history of IV drug injection and high risk behaviors (13), therefore, our objectives were to estimate the seroprevalence of HCV using rapid testing in substance abusers and to evaluate some epidemiological features of this subpopulation in Fars province, southern Iran.

## MATERIALS AND METHODS

### Ethical statement

Written informed consents were obtained from all participants and the study was approved by the Ethics Committee of Shiraz University of Medical Science, Shiraz, Iran. All efforts were made to guarantee privacy and confidentiality during interviews. Also, the study protocol conforms to the ethical guideline of the 1975 Declaration of Helsinki, as revised in 1983.

### Subjects

In a cross-sectional study by using Cochran formula and assuming p=0.03, q=0.97, d=0.01, and α=0.95, the sample size of 1049 was calculated. In the present study 1043 drug addicts who were referred to drug rehabilitation centers affiliated to Shiraz University of Medical Sciences were enrolled from 2007 to 2012. Statistical power for this study was 0.95. Individual files containing information about sex, age, type and duration of addiction treatments, marital status, housing, jobs, education, age in which the first drug and first IV drug were used, history of psychiatric problems, history of imprisonment, times and duration of injections with own or others' needles, and having safe or unsafe sexual activity were created. Our study had no exclusion criteria except voluntary withdrawal from the study.

### Blood sampling and HCV testing

The blood samples (10 ml) were taken from the cubical vein of 772 participants who wanted to deliver blood. The samples were cooled on ice and were taken to a specialized laboratory affiliated to Gastroenterohepatology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. The blood samples were centrifuged at 3500 rpm for 15 min at 4°C and the sera were separated and stored at -70 °C until checked for HCV infection using anti-HCV antibody (IgG) assay through a third-generation indirect enzyme immunoassay (EIA) kit (Acon Laboratories, Inc, USA). This test can detect various subtypes of HCV antibodies using the recombinant antigens specific for core, NS3, NS4, and NS5. The clinical sensitivity and specificity of this kit are > 99.9% and 99.8%, respectively.

### Statistical analysis

Data were expressed as mean and standard deviation (SD) for quantitative variables and frequency and percentage for qualitative ones. All data were analyzed using SPSS software version 20.0 (Washington, USA) for Windows. Qualitative data were analyzed using Chi-square and Fisher's exact tests to find any association between risk factors and HCV antibody positivity. An independent samples t test and one way ANOVA were used to compare the quantitative variables between

different categories. P values less than 0.05 were considered as statistically significant.

## RESULT

Out of a total of 1043 participants, 1009 (96.7%) were male. A total age range of 57 years (18-75 years) and mean±SD of 38.82±11.01 years were calculated. Finally, we enrolled just 772 participants for anti-HCV antibody testing. Of them, 662 (85.8%) participants had negative and 110 (14.2%) participants had positive anti-HCV tests. Frequency and percentage of anti-HCV antibody based on different categories and risk factors are presented in table 1.

The correlation between qualitative variables and risk of anti-HCV antibody positivity was also checked using cross-tabulation. As demonstrated, significant relationships were detected between anti-HCV antibody positivity and education, imprisonment history, jobs, marital status, and IV abusing ($p<0.05$). The history of imprisonment showed a significant relationship with anti-HCV antibody positivity. The highest and lowest positive HCV percentages belonged to illiterates and individuals with college level of education, respectively. Also, in the jobs status, the highest and lowest positive HCV percentages were found in unemployed individuals and housewives, respectively. Finally, married participants had the lowest and widows had the highest percentage of anti-HCV antibody positivity from the marital status point of view.

The mean and SD of quantitative variables in anti-HCV antibody positive and negative participants are presented and compared in table 2. As demonstrated, there were no significant differences in all of the variables except the age at the first use between anti-HCV antibody positive and negative participants. Age at the first drug use was significantly lower in participants who had positive anti-HCV antibody ($p<0.001$).

## DISCUSSION

In the present study, the anti-HCV antibody status of drug abusers who were referred to drug rehabilitation centers affiliated to Shiraz University of Medical Sciences was evaluated. Also, the related risk factors were compared between anti-HCV antibody positive and negative groups. The seroprevalence

**Table 1: Frequency (percentage) and comparison of qualitative variables in participants with positive and negative anti-HCV antibody**

| Variables | Anti-HCV antibody | | |
|---|---|---|---|
| | Positive | Negative | *P* value |
| **Sex** | | | 0.275 |
| Male | 118 (14.5%) | 698 (85.5%) | |
| Female | 2 (7.1%) | 26 (92.9%) | |
| **Education** | | | 0.015 |
| Illiterate | 4 (28.6%) | 10 (71.4%) | |
| Preliminary | 23 (18.1%) | 104 (81.9%) | |
| Secondary | 36 (15.5%) | 196 (84.5%) | |
| High school | 42 (14.4%) | 249 (85.6%) | |
| College | 5 (4.6%) | 103 (95.4%) | |
| **Age, years** | | | 0.632 |
| ≤20 | 0 (0%) | 10 (100%) | |
| 21-40 | 66 (14.5%) | 388 (85.5%) | |
| 41-60 | 40 (14.2%) | 242 (85.8%) | |
| ≥61 | 4 (15.4%) | 22 (84.6%) | |
| **Housing** | | | 0.530 |
| Home | 72 (15.7%) | 388 (84.3%) | |
| Rental | 37 (12.1) | 269 (87.9) | |
| Homeless | 0 (0%) | 1 (100%) | |
| Others | 1 (20.0%) | 4 (80.0%) | |
| **Imprisonment history** | | | <0.001 |
| Yes | 62 (32.1%) | 131 (67.9%) | |
| No | 48 (8.3%) | 531 (91.7%) | |
| **Jobs** | | | 0.005 |
| Full time | 55 (11.1%) | 442 (88.9%) | |
| Partial (regular) | 7 (17.5%) | 33 (82.5%) | |
| Partial (irregular) | 8 (16.0%) | 42 (84.0%) | |
| Student | 2 (16.7%) | 10 (83.3%) | |
| Housewife | 2 (8.0%) | 23 (92.0%) | |
| Pensioner | 9 (20.5%) | 35 (79.5%) | |
| Freelance worker | 2 (14.3%) | 12 (85.7%) | |
| Unemployed | 25 (27.8%) | 65 (72.2%) | |
| **Marital status** | | | 0.001 |
| Single | 35 (20.3%) | 137 (79.7%) | |
| Married | 59 (11.0%) | 477 (89.0%) | |
| Divorced | 11 (22.9%) | 37 (77.1%) | |
| Widowed | 5 (33.3%) | 10 (66.7%) | |
| **Treatments** | | | 0.462 |
| MMT | 103 (14.7%) | 596 (85.3%) | |
| DTX | 1 (6.2%) | 15 (93.8%) | |
| BMT | 6 (10.7%) | 50 (89.3%) | |
| **Psychiatric history** | | | 0.346 |
| Yes | 11 (18.3%) | 49 (81.7%) | |
| No | 99 (13.9%) | 613 (86.1%) | |
| **IV user** | | | <0.001 |
| Yes | 67 (51.9%) | 62 (48.1%) | |
| No | 43 (6.7%) | 600 (93.3%) | |

MMT: methadone maintenance treatment, DTX: detoxification, BMT: buprenorphine maintenance treatment

**Table 2:** **Comparison of quantitative variables in anti-HCV antibody positive and negative participants**

| Variables | Anti-HCV antibody | | *P* value |
|---|---|---|---|
| | Positive | Negative | |
| Age (year) | 39.88±12.43 | 38.75±10.78 | 0.368 |
| Age at first use (year) | 20.19±5.46 | 22.67±7.17 | <0.001 |
| Age at first IV use (year) | 26.70±7.19 | 28.43±8.66 | 0.217 |
| Number of protected sexual activities | 0.78±2.07 | 0.62±1.82 | 0.401 |
| Number of unprotected sexual activities | 1.44±2.39 | 1.80±2.82 | 0.212 |
| Number of IV drug use per past 30 days | 0.10±0.53 | 0.55±2.81 | 0.225 |
| Number of days with IV drug use per past 30 days | 0.63±3.85 | 0.40±2.17 | 0.688 |
| Number IV drug use by others' needles per past 30 days | 0.00±0.00 | 0.01±0.15 | 0.684 |

ALT: alanine aminotransferase, AST: aspartate aminotransferase,
GGT: gamma-glutamyltransferase, SD: standard deviation

of HCV in this high risk subpopulation was 14.2%. As mentioned previously (16), this rate is dependent on many factors including socioeconomic status and other related factors. Totally, we found that higher education, no imprisonment history, having a job, having a partner, and higher age at the first drug use had a significant negative relationship with anti-HCV antibody positivity. There were no significant differences between HCV-positive and negative groups with regards to other evaluated risk factors.

The number of persons with anti-HCV in the world has increased from an estimated 122 million in 1990 to an estimated 184 million in 2005 (17). In addition, although women are half as likely as men to develop a drug abuse related problem, they have higher rates of morbidity than male users (18). This enhancement is more obvious in high risk populations. IV drug users are the main at-risk population for HCV transmission. It has been reported that 74% of IV drug users were positive for HCV RNA (19) that is much higher than our finding about the seropositivity of such participants. Our findings are approximately similar to other studies in high risk subpopulations such as those reported by Shamsdin and colleagues in hemophilia (8.9%) and Abolghasemi and co-workers in thalassemia (16%) (7, 20).

We found a significant association between the history of imprisonment and HCV infection. This is similar to what observed by Hickman and colleagues (21) and Demetriou and co-workers (22) but is different from the report by Samimi-Rad and colleagues (19). This significant association may be due to needle sharing and lack of disposable needles in prisons. Demetriou and colleagues, by evaluating 40 users in treatment centers found that the only significant factor predicting HCV was the duration of injection drug use (22). This significant relationship may be due to the small sample size of that study because this risk factor showed no significant association with anti-HCV antibody positivity in our study. Other related risk factors reported in this study included lower level of education, lack of a job with appropriate income, no marriage, and long period of drug use. These risk factors expose the participants to higher mental pressure and stress or increased risk of HCV transmission. However, we report these risk factors for the first time and their confirmation needs further studies in larger populations.

In conclusion, we reported here that anti-HCV antibody positivity in participants with drug abuse is 14.2% and some risk factors especially level of education, history of imprisonment, job, marital status, and age at the first drug use have significant association with this prevalence. However, our study suffered from two important limitations. The first one is the lack of any molecular study and evaluation of the participants to find the main genotype of HCV in this high risk population. The second limitation is the lack of any history about the use of antiviral therapy, which can affect the reported prevalence. Therefore, we recommend evaluating such HCV positive participants for detectible HCV RNA and genotype distribution using conventional PCR and/or real time PCR, and also providing complete history about the type and duration

of antiviral therapy. These issues are being set up and performed in our center for larger studies.

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## CONFLICT OF INTERESTS

The authors declare no conflict of interest related to this work.

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