

# Prevalence of hepatitis C virus infection and risk factors of drug using prisoners in Guilan province

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معدل انتشار العدوى بفيروس التهاب الكبد « سي »، وعوامل الاختطار بين متعاطي المخدرات في سجون مقاطعة جيلان

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**الخلاصة:** أجرى الباحثون هذه الدراسة المتعددة القطاعات لتحديد مدى انتشار فيروس التهاب الكبد « سي »، والسلوكيات المخوفة بالمخاطر بين متعاطي المخدرات في سجون مقاطعة جيلان، شمال جمهورية إيران الإسلامية. وقد تم سؤال الأشخاص عن السلوكيات المخوفة بالمخاطر المرتبطة باكتساب فيروس الكبد « سي »، كما أُخذت عينات دم لاختبار الأجسام المضادة لفيروس الكبد « سي » باستخدام طرائق مقايسة المتر المناعي المرتبط بالإنزيم ELISA. فوجد في 460 نزيلًا، أن وسطي مدة التعاطي بلغ 8.9 سنة، وكان 51.7٪ منهم يتعاطون الأفيون، و18.3٪ منهم يتعاطون الهيروين. كما كانت السلوكيات المخوفة بالمخاطر والتي تؤدي إلى انتشار فيروس التهاب الكبد « سي » شائعة بين المسجونين، إذ وجد أن 209 من المساجين (45.4٪) هم إيجابيو الاختبار للأجسام المضادة لفيروس الكبد « سي » (88.9٪ من متعاطي المخدرات حقنًا بالوريد). وقد ترابطت إيجابية فيروس الكبد « سي » ترابطًا يُعتدُّ به إحصائيًا مع تعاطي المخدرات حقنًا، والوشم الجلدي، وعدد مرات الدخول إلى السجن.

**ABSTRACT** This was a cross-sectional prevalence study to determine the prevalence of hepatitis C virus (HCV) and high-risk behaviours in drug abusers admitted to prison in Guilan province, northern Islamic Republic of Iran. Subjects were asked about risk behaviours for acquiring HCV and blood was drawn for HCV antibody testing using ELISA techniques. Of 460 inmates, the mean duration of drug use was 8.9 years; 51.7% were opium users and 18.3% heroin users. HCV risk behaviours were common in this population and 209 inmates (45.4%) were HCV antibody positive (88.9% of intravenous drug abusers). HCV-positive status was significantly associated with intravenous drug use, having skin tattoos and number of times in prison.

## Prévalence de l'infection par le virus de l'hépatite C et des facteurs de risque chez les détenus toxicomanes dans la province de Guilan

**RÉSUMÉ** Il s'agit ici d'une étude transversale de prévalence qui se propose de déterminer la prévalence du virus de l'hépatite C (VHC) et des comportements à haut risque chez les toxicomanes séjournant en prison dans la province de Guilan au nord de la République islamique d'Iran. Les sujets ont été interrogés sur les comportements à risque de contamination par le VHC et des prélèvements sanguins ont été effectués pour recherche des anticorps anti-VHC selon la méthode ELISA. Pour les 460 détenus interrogés, l'ancienneté moyenne de la toxicomanie était de 8,9 ans ; 51,7 % d'entre eux consommaient de l'opium et 18,3 % de l'héroïne. Les comportements à risque de transmission du VHC étaient répandus dans cette population et 209 détenus (45,4 %) présentaient des anticorps anti-VHC positifs (88,9 % des usagers de drogues par voie intraveineuse). Il est apparu une association significative entre la séropositivité VHC et l'usage de drogues par voie intraveineuse, les tatouages et le nombre de séjours en prison.

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## Introduction

Hepatitis C virus (HCV) is a leading cause of liver failure leading to liver transplantation in adults. Identified risk factors for HCV infection include intravenous (IV) drug use, exposure to infected blood products, and intranasal drug use [1]. High risk sexual activity (multiple sexual partners, history of sexually transmitted diseases), tattooing, and skin piercing have also been suggested to be associated with increased risk for HCV [2]. Whereas the overall seroprevalence of HCV among American adults has been estimated to be between 1% and 2% [3], the prevalence of HCV has been shown to be as high as 80% in populations of adults who use IV drugs or are incarcerated [4].

Because of its geographic position, the Islamic Republic of Iran is an important route for illegal drug trafficking across Asia. Involvement in drug trafficking is the principal cause of imprisonment in the country and every year more than 2 million prisoners are released from prisons. Several studies have provided evidence that high rates of high-risk behaviours (injecting drug use, sharing of needles and syringes, sexual activity, tattooing) occur in prisoners [5–10] and HCV infection is a major health problem in prisons, particularly among injecting drug users [11–23]. Therefore prisoners in the Islamic Republic of Iran are at high risk for transmission of HCV and other infections.

The aim of this paper was to establish the prevalence of antibodies to hepatitis C and describe the risk factors in drug users entering Lakan prison, the main prison in Guilan province, northern Islamic Republic of Iran.

## Methods

We conducted a cross-sectional prevalence study of HCV infection in all drug users who were admitted to the main prison in Guilan province between September 2003 and November 2003 ( $n = 460$ ). We visited the prison in advance and described the aims of the study to staff and drug abusing prisoners. Participation in the study was voluntary, but no one refused to participate and all drug abusing prisoners were enrolled in the study.

A self-administered questionnaire was used, derived from questionnaires used in prison surveys in Ireland [7], Germany [15] and Brazil [6]. The questionnaire consisted of 2 sections. Section 1 collected demographic data, including age, educational level, marital status and drug use among family members. Section 2 asked about behavioural characteristics that might have put the prisoner at risk for acquiring HCV infection, such as type of drugs used, sharing injection equipment, skin tattooing, history of blood transfusion, age of starting drug use, duration of incarceration, previous incarceration, and number of imprisonments. To ensure the reliability of responses, interviews were conducted in closed rooms by the trained co-workers of our team, and official staff of the prison did not have access to the answers of individual questionnaires.

From each prisoner 4 mL of blood was drawn and centrifuged in the prison laboratory. Then sera were sent for further tests to the central laboratory of the University of Guilan in cold boxes at 2–8 °C. Sera were screened by standard enzyme-linked immunosorbent assay (ELISA) techniques with commercial kits from CAPTIA™ HCV

Ab EIA (Trinity Biotech, Bray, Ireland). Samples with a positive ELISA reaction to HCV were rechecked.

### Analysis

The chi-squared test was used to assess the association between categorical variables and the outcome variable HCV. Logistic regression analysis was performed to adjust for potential confounding effects on the exposure–outcome association. Statistical analysis was made with *SPSS*, version 11.5 software, and the level of significance was taken to be  $P < 0.05$ .

### Results

Of the 460 prisoners the mean age was 34.7 [standard deviation (SD) = 8.9] years (range 18–65 years). The median duration of drug use was 7 years and the mean was 8.9 (SD = 7.7) years, the mean age of starting drug use 25.5 (SD = 7.9) years and the mean duration of incarceration 4.3 (SD = 4.7) years. All participants were male, 63.4% were married, 50.1% illiterate or < 5 grade education and 90.9% were cigarette smokers (Table 1).

The main drugs used were opium (51.7% of respondents), heroin (18.3%) and cannabis (12.4%) (Table 1). High-risk behaviours were common in our study population: 17.6% were IV drug users, 56.1% intranasal drug users, 56.1% had skin tattoos and 39.6% a history of shared injection equipment. A history of blood transfusion was present in 2.2% of inmates.

The ELISA analysis showed 209 respondents were positive for HCV antibodies, a prevalence of 45.4% (95% CI 43.3%–49.9%) among this group of drug using prisoners. This rate rose to 88.9% (95% CI 82.3%–95.5%) among the 81 prisoners who reported being IV drug abusers.

Table 1 Demographic features and drug use behaviour of 460 prisoners

Variable	No.	% <sup>a</sup>
<i>Marital status</i>		
Single	157	34.2
Married	291	63.4
Divorced	11	2.4
<i>Education</i>		
Illiterate	60	13.2
1–5 years	168	36.9
6–8 years	166	36.5
9–12 years	49	10.8
> 12 years	12	2.6
<i>Employment status</i>		
Unemployed	153	33.3
Temporary work	182	39.6
Full-time work	125	27.2
<i>Current cigarette smoker</i>		
Yes	418	90.9
No	42	9.1
<i>Main substance used</i>		
Opium	226	51.7
Heroin	80	18.3
Cannabis/hashish	54	12.4
Other	77	17.6
<i>Route of use of main substance</i>		
Inhalation	258	56.1
Injection	81	17.6
Oral	99	21.5
Other	22	4.8
<i>Duration of drug use</i>		
< 1	37	9.7
1–5	128	33.4
> 5	218	56.9
<i>Ever shared equipment<sup>b</sup></i>		
Yes	180	39.6
No	275	60.4
<i>Skin tattoos</i>		
Yes	256	56.1
No	198	43.9
<i>Drug abusers in family</i>		
Yes	65	15.4
No	358	84.6

Table 1 Demographic features and drug use behaviour of 460 prisoners (concluded)

Variable	No.	% <sup>a</sup>
<i>No. of times in prison</i>		
1	180	39.1
2–5	201	43.7
> 5	61	13.3
Unknown	18	3.9
<i>Duration of current incarceration (years)</i>		
< 1	136	30.2
1–5	199	44.2
> 5	115	25.6

<sup>a</sup>Percentages are based on the total number of respondents to each question (some missing responses).

<sup>b</sup>Syringes, razors, etc.

In univariate analysis, a variety of behavioural variables were significantly associated with seropositivity for HCV, respectively (Table 2). An HCV positive result was associated with marital status, duration of drug use, IV drug use, ever shared injection equipment, duration of incarceration, tattoos and number of times in prison.

After adjusting for confounding effects with logistic regression analysis, IV drug use, number of times in prison and having skin tattoos remained the significant determinants of HCV infection (Table 3).

## Discussion

This study documents a high rate of hepatitis C infection among imprisoned drug abusers especially intravenous drugs users, similar to that reported in studies of prisoners in other countries [11–23]. This HCV infection rate (45.4%) is 90 times higher than blood donors (0.5%) from the same region [24].

The study highlights the risks of imprisonment on the behaviour of drug users.

Table 2 Association between behavioural characteristics and hepatitis C virus (HCV) seropositivity among drug users

Variable	HCV +ve No.	HCV -ve No.	P-value
<i>Marital status</i>			
Single	87	70	
Married	116	175	
Divorced	5	6	0.002 <sup>a</sup>
<i>Duration of drug use (years)</i>			
< 1	10	27	
1–5	60	68	
> 5	120	98	0.002 <sup>b</sup> ; 0.032 <sup>a</sup>
<i>Route of use of substance</i>			
IV	72	9	
Non-IV	130	224	< 0.0001
<i>Ever shared injection equipment</i>			
Yes	97	83	
No	108	167	0.002
<i>Skin tattoos</i>			
Yes	136	120	
No	70	128	0.001
<i>No. of times in prison</i>			
1	41	139	
2–5	111	90	< 0.0001 <sup>a,b</sup>
> 5	47	14	0.002 <sup>c</sup>
<i>Duration of incarceration (years)</i>			
< 1	31	105	
1–5	98	101	< 0.0001 <sup>a,b</sup>
> 5	77	41	0.006 <sup>c</sup>

IV = intravenous.

<sup>a</sup>Significant difference between groups 1 and 2.

<sup>b</sup>Significant difference between groups 1 and 3.

<sup>c</sup>Significant difference between groups 2 and 3.

ers. More than half of all prisoners had tattoos and 39% had ever shared injection equipment. In prisons, syringes and tattoo equipment tends to be used by many individuals. Thus, the risk of contamination by bloodborne viruses is much higher in prison

**Table 3 Significant determinants of hepatitis C virus seropositivity among drug users**

Variable (baseline)	Odds ratio (95% CI)	P-value
<i>Route of use of substance</i>		
Non-IV	1	
IV	8.1 (3.6–18.2)	< 0.0001
<i>Skin tattoos</i>		
No	1	
Yes	1.8 (1.1–3.1)	0.022
<i>No. of times in prison</i>		
1	1	
2–5	3.1 (1.7–5.5)	< 0.0001
> 5	6.7 (2.8–15.7)	< 0.0001

IV = intravenous.

CI = confidence interval.

than outside where equipment is usually shared with only 1 or 2 other people [15]. In most prisons, it is difficult to entirely prevent injecting drug use; however, the risks of injection with contaminated equipment could be substantially reduced if sterile injection equipment was available. In a few countries, sterile injection equipment has been provided in prisons and initial evaluation has not shown adverse effects such as increased injecting drug use [15].

The high HCV prevalence among drug users who had drug use for less than 1 year suggests that they become HCV infected soon after they start drug use.

In this study, duration of incarceration correlated with HCV infection, as reported in a number of previous studies [13,14,20,22,23]. We found that previous imprisonment was a significant risk factor for HCV infection, suggesting that measures to minimize the spread of hepatitis within prisons are essential.

A high prevalence of HCV infection was also found in non-intravenous drugs users.

Unfortunately, the social and cultural context of the Islamic Republic of Iran deterred the researchers from attempting to obtain information on sexual risk behaviour. Thus, having skin tattoos was the only independent risk factor identified for the presence of HCV antibodies in respondents who had never used injected drugs. Researchers have reported the presence of hepatitis C antibodies in an individual with a tattoo but no other risk factors [25].

In this study, marital status correlated with HCV infection and high rate of infection was shown among single men. This may be due to a higher rate of risky behaviour among this group in comparison to married participants such as having tattoos (64.1% versus 51.9%) and injecting drug use (26.0% versus 13.9%). It should also be mentioned that single men are more likely to engage in risky sexual behaviour.

Finally, injecting drug use was by far the most important risk factor for hepatitis C and this is in agreement with other studies [6–10,12–15,17,19–23].

Some limitations of our study should be considered as in other cross-sectional studies. Increased risk associated with exposure to prison is probably because of the high-risk injection practices adopted in prison (such as sharing a small number of equipment with a large number of inmates) rather than spending time in prison in itself. Although care was taken to minimize bias and preserve confidentiality, we were aware of the sensitivity of the issues, particularly in the area of illicit drug use. The study was also unable to investigate sexual behaviour.

Despite these limitations, we believe that this study has important public health implications:

- As many drug users spend time in prison, it is an appropriate point for intervention to break the cycle of infection by edu-

cating them about the risks of hepatitis transmission.

- As imprisonment leads to high-risk practices, this survey points to the need for increased infection control and harm reduction measures in prisons.
- Screening for HCV infection in prison entrants and educational programmes to encourage discontinuation of high-risk behaviours might help curtail the rise in HCV infection in incarcerated populations.

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