Hepatitis C Virus Infection in Isfahan, Iran: A Review Article

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Abstract

Context: The hepatitis C virus (HCV) is a serious worldwide health problem. The HCV infection prevalence rate has been estimated to be approximately 0.16% in the general Iranian population. In this review, the authors summarize various epidemiological studies of HCV infection in Isfahan, Iran.

Evidence Acquisition: Published studies were accessed from PubMed, Ovid, EMbase, Google Scholar, Iranmedex, Magiran, and the Scientific Information Database (SID), as well as from a manual search using references cited in relevant papers.

Results: Twenty-eight studies, including 6, 17, 4, and 1, reported a prevalence of HCV in Isfahan province, and Isfahan, Kashan, and Foulad shahr cities. Sample sizes ranged from 73 to 542,705. The highest prevalence of HCV infection was reported in HIV-infected patients, and the lowest prevalence was found in laboratory workers.

Conclusions: The results of this study revealed the important role injection drug use plays as the main cause of HCV spread in Isfahan province. Effective harm reduction programs should be implemented to prevent new HCV infections. Considering the high prevalence of HCV infection among HIV patients, this group should receive special attention.

Keywords: Prevalence, Hepatitis C Virus, Isfahan, Iran

1. Context

The hepatitis C virus (HCV) is the most common blood-borne disease worldwide, with more than 170 - 200 million people affected (1). Most people with the HCV progress to a chronic infection, which can lead to hepatic fibrosis, cirrhosis, liver failure, hepatocellular carcinoma, and death (2). Despite declining incidence of new infections, prevalence of the HCV remains high and is expected to increase over the next decade, potentially causing substantial morbidity and mortality (1). The sources of the infection include transfusion of blood products and contamination during medical procedures, intravenous drug use, sexual exposure, and mother to child transmission (3).

Prevalence of the HCV varies from 0.2% - 40% depending on the country (1, 4), but it is lowest in developed nations and highest in developing nations (5). For example, in China (6, 7), Japan (8), and India (8), prevalence rates have been estimated to be approximately 1%, 0.49%, and 1.85%, respectively, among blood donors. In Malaysia (9), Singapore (10), and Thailand (11), prevalence has been reported to be as high as 1.6%, 0.54%, and 5.6%, respectively. In comparison, the prevalence rates in Saudi Arabia and Yemen are 1.8% and 2.1%, respectively (12, 13).

Studies on the prevalence of HCV infection in different regions or among high-risk groups in Iran have been conducted and have estimated the prevalence rate to be approximately 0.16% in the general population (14). The first paper was published in 1994, using samples from Iranian blood donors (15). In 2007, the prevalence of HCV Ab was 0% in Tehran and Khuzestan (4, 17) but 1.3% in the Guilan province (18). The purpose of this brief review is to summarize various epidemiological studies of HCV infection in Isfahan, Iran.

2. Evidence Acquisition

2.1. Search Strategy and Identification of Studies

To identify relevant studies, PubMed, Ovid, EMbase, Google Scholar, Iranmedex, Magiran, and the scientific information database (SID) were searched for all epidemiological studies on HCV prevalence dating up to June 2012, using the keywords: hepatitis C, HCV, HCV Ab prevalence, and epidemiology. The keywords were combined with Isfahan or Esfahan to limit the studies to those involving human subjects. Additionally, reference lists from the identified publications were reviewed for additional pertinent
studies. The Iranian center for scientific documents and records (IranDoc) was also searched for students' theses. No language restrictions were imposed.

2.2. Eligibility Criteria

All epidemiological studies published in peer-reviewed journals or students’ dissertations that reported the prevalence of HCV infections based on HCV antibody screenings using ELISA or RIBA/PCR were selected. Because this study attempted to estimate the prevalence of HCV in Isfahan province, only studies with source populations resided in Isfahan were included. None of the study subjects had serious medical problems related to the liver and none took medication affecting liver enzymes.

Twenty-eight cross-sectional studies were considered for inclusion in this review (19-46). Six studies assessed the prevalence of the HCV in Isfahan province (30-34, 41), 17 studies assessed the prevalence in Isfahan city (21-25, 28, 29, 35-40, 42-44, 46), four studies assessed the prevalence in Kashan city (19, 20, 26, 45), and one study assessed prevalence of the virus in Foulad-Shahr city (27).

2.3. Data Extraction

Data were extracted pertaining to publication information (including the first author’s last name, the year of publication, and the city or population studied), study design, and the number, age, and gender of the individuals involved. Information on study design, participant characteristics, prevalence of HCV infection, and laboratory measurements was extracted independently by two reviewers. Discrepancies were resolved by discussion.

3. Results

After the studies were reviewed, 29 were found that discussed HCV prevalence in Isfahan province, including 25 articles (19-43), three student theses (44-46), and one research project (47). The research project (47) was excluded because it remains ongoing; therefore, 28 relevant studies of satisfactory quality were found. Seventeen investigations were chosen from studies conducted in Isfahan city (21-25, 28, 29, 35-40, 42-44, 46), four from Kashan city (19, 20, 26, 45), and one from Foulad-Shahr city (27). Other studies were associated with other parts of Isfahan province. The sample sizes ranged from 73 - 542,705, and 25 studies were cross-sectional.

3.1. The Prevalence of HCV Among Blood Donors

Seven studies (19-24, 44) were found during the literature review about HCV prevalence among blood donors in Isfahan province. Table 1 shows these search results. From these seven studies, five were performed in Isfahan city (21-24, 44) and two studies were performed in Khashan city (19, 20). Masaelli et al. (21) compared HCV Ab prevalence between regular, sporadic, and first-time blood donors in Isfahan city and found that the HCV Ab was less common among regular blood donors than sporadic and first-time donors. In a similar study in Isfahan, the frequency of HCV Ab in regular donors and first-time blood donors was 0.23% and 0.53%, respectively (23). Salehi et al. (22) evaluated blood samples from two groups of donors (routine and religious ceremony donors) for HCV Ab. The results of this study showed no statistical difference in HCV Ab prevalence between these two groups. In Ebrahimian’s study, HCV Ab seropositivity was less common in volunteers referred to the Isfahan blood transfusion organization between 2004 and 2008 but more common from 2008 to 2009 (24). Similarly, the prevalence of HCV Ab infection among healthy volunteer blood donors referred to the Kashan blood bank significantly increased from 0.38% in 1996 to 1.71% in 2001 (19).

3.2. The Prevalence of HCV in High-Risk Populations

3.2.1. Injection Drug Users

Injection drug use (IDU) is considered a primary cause of HCV infection (48). The prevalence of the HCV among injection drug users in Isfahan ranges from 23.3% - 75.5% (25-32). This wide range reported in studies is partially explained by variations in the duration of IDU among subjects. Younger age groups had a significantly lower prevalence of the HCV than older age groups, although age is likely associated with the duration of IDU. In fact, the study that found a 23.3% prevalence of HCV only included people younger than 30 years of age (29). Eight studies were found (25-32) on HCV prevalence among injection drug users in Isfahan province (Table 1). Khoshvash et al. (28) and Meidani et al. (29) evaluated the frequency of HCV cases among drug users who were admitted to Al-Zahra Hospital in Isfahan from 2004 to 2005 and 2007 to 2008, respectively. A similar study was conducted in Kashan from 2001 to 2006 (26). Tayeri et al. (25) assessed the prevalence of HCV in HIV positive patients with a history of IDU and found it to be 75.5%. In Fadaei Nobari et al. (32), the prevalence of HCV was evaluated among intravenous drug users in Isfahan province.

3.3. Incarcerated Populations

The true prevalence of the HCV in incarcerated populations is difficult to obtain because no mandated screening programs exist, and the number of studies that have investigated HCV prevalence in this population is limited. The only data from the Isfahan correctional system were from a cross-sectional study of 160 young prisoners from Isfahan.
### Table 1. Cross-Sectional Studies of the Prevalence of HCV Infection in Isfahan Province That Satisfied the Eligibility Criteria for Inclusion in This Systematic Review

<table>
<thead>
<tr>
<th>Source</th>
<th>Year of Publication</th>
<th>City</th>
<th>Study Population</th>
<th>Number of Participants</th>
<th>No. (%) of HCV Cases</th>
<th>Age, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mojtabavi et al. (1)</td>
<td>2007</td>
<td>Isfahan Province</td>
<td>Hemophilic patients</td>
<td>553</td>
<td>553 (22.6)</td>
<td>23.4 ± 12.9</td>
</tr>
<tr>
<td>Afzali et al. (5)</td>
<td>2001</td>
<td>Kashan city</td>
<td>Regular blood donors</td>
<td>4570</td>
<td>4570 (31.3)</td>
<td>-</td>
</tr>
<tr>
<td>Yazdani et al. (4)</td>
<td>2002</td>
<td>Isfahan Province</td>
<td>Hemophilic patients</td>
<td>560</td>
<td>560 (60)</td>
<td>24</td>
</tr>
<tr>
<td>Ataei et al. (36)</td>
<td>2002</td>
<td>Isfahan city</td>
<td>Patients with beta-thalassemia</td>
<td>466</td>
<td>466 (10)</td>
<td>7.46 ± 8.3</td>
</tr>
<tr>
<td>Ataei et al. (35)</td>
<td>2010</td>
<td>Isfahan Province</td>
<td>HIV-infected patients</td>
<td>150</td>
<td>150 (77)</td>
<td>50.2 ± 8.0</td>
</tr>
<tr>
<td>Lengani et al. (44)</td>
<td>1999</td>
<td>Isfahan city</td>
<td>Regular blood donors</td>
<td>43,731</td>
<td>43,731 (1.1)</td>
<td>-</td>
</tr>
<tr>
<td>Hashemi et al. (45)</td>
<td>2002</td>
<td>Isfahan city</td>
<td>HIV-infected patients</td>
<td>130</td>
<td>130 (77)</td>
<td>50.2 ± 8.0</td>
</tr>
<tr>
<td>Tajeri et al. (34)</td>
<td>2010</td>
<td>Kashan city</td>
<td>Injection drug users</td>
<td>104</td>
<td>104 (75.5)</td>
<td>10.2 ± 10.2</td>
</tr>
<tr>
<td>Moniri et al. (20)</td>
<td>2004</td>
<td>Kashan city</td>
<td>Regular blood donors</td>
<td>600</td>
<td>600 (16.5)</td>
<td>-</td>
</tr>
<tr>
<td>Sharif et al. (26)</td>
<td>2009</td>
<td>Kashan city</td>
<td>Injection drug users</td>
<td>200</td>
<td>200 (1)</td>
<td>-</td>
</tr>
<tr>
<td>Masoufi et al. (18)</td>
<td>2006</td>
<td>Isfahan city</td>
<td>Regular blood donors</td>
<td>16,620</td>
<td>16,620 (0.19)</td>
<td>-</td>
</tr>
<tr>
<td>Salehi et al. (22)</td>
<td>2011</td>
<td>Kashan city</td>
<td>Regular blood donors</td>
<td>2,635</td>
<td>2,635 (0.15)</td>
<td>-</td>
</tr>
<tr>
<td>Pourazari et al. (21)</td>
<td>2006</td>
<td>Isfahan city</td>
<td>Regular blood donors</td>
<td>386</td>
<td>386 (1)</td>
<td>-</td>
</tr>
<tr>
<td>Asadi et al. (16)</td>
<td>2009</td>
<td>Kashan city</td>
<td>Injection drug users</td>
<td>92</td>
<td>92 (22.5)</td>
<td>-</td>
</tr>
<tr>
<td>Ebrahimbaylan et al. (28)</td>
<td>2009</td>
<td>Isfahan city</td>
<td>Regular blood donors</td>
<td>54,270</td>
<td>54,270 (0.18)</td>
<td>-</td>
</tr>
<tr>
<td>Amini et al. (15)</td>
<td>2010</td>
<td>Isfahan city</td>
<td>Street children</td>
<td>386</td>
<td>386 (1)</td>
<td>12.62 ± 3.23</td>
</tr>
<tr>
<td>Ataei et al. (11)</td>
<td>2008</td>
<td>Isfahan city</td>
<td>Transit heavy vehicle drivers</td>
<td>325</td>
<td>325 (31.3)</td>
<td>40.1 ± 9</td>
</tr>
<tr>
<td>Mehdani et al. (24)</td>
<td>2009</td>
<td>Isfahan city</td>
<td>Injection drug users</td>
<td>38</td>
<td>38 (100)</td>
<td>30.7 ± 7.09</td>
</tr>
<tr>
<td>Zarnani et al. (27)</td>
<td>2010</td>
<td>Foulad-Shahr city</td>
<td>Injection drug users</td>
<td>318</td>
<td>318 (100.0)</td>
<td>-</td>
</tr>
<tr>
<td>Nokhodian et al. (10)</td>
<td>2010</td>
<td>Isfahan Province</td>
<td>Injection drug users</td>
<td>345</td>
<td>345 (100.0)</td>
<td>22 ± 6.0</td>
</tr>
<tr>
<td>Nokhodian et al. (16)</td>
<td>2012</td>
<td>Isfahan city</td>
<td>Young prisoners</td>
<td>360</td>
<td>360 (100.0)</td>
<td>10.59 ± 12.4</td>
</tr>
<tr>
<td>Kalantarpour et al. (18)</td>
<td>2011</td>
<td>Isfahan city</td>
<td>Thalasemic patients</td>
<td>545</td>
<td>545 (100.0)</td>
<td>18.7 ± 6.0</td>
</tr>
<tr>
<td>Kassanian et al. (19)</td>
<td>2002</td>
<td>Isfahan city</td>
<td>Hemophilic patients</td>
<td>615</td>
<td>615 (100.0)</td>
<td>27.1 ± 12.8</td>
</tr>
<tr>
<td>Fadaei Nobari et al. (32)</td>
<td>2012</td>
<td>Isfahan Province</td>
<td>Injection drug users</td>
<td>594</td>
<td>594 (100.0)</td>
<td>32.6 ± 9.4</td>
</tr>
<tr>
<td>Kassanian et al. (27)</td>
<td>2011</td>
<td>Kashan city</td>
<td>Women exhibiting illegal social behavior</td>
<td>100</td>
<td>100 (100.0)</td>
<td>30.24 ± 9.34</td>
</tr>
<tr>
<td>Shoaei et al. (41)</td>
<td>2002</td>
<td>Isfahan city</td>
<td>Laboratory healthcare workers</td>
<td>203</td>
<td>203 (100.0)</td>
<td>10.5 ± 8.54</td>
</tr>
</tbody>
</table>

Correctional facilities, conducted in 2012, which showed a prevalence of HCV of 4.4% [39]. Because prisoners do not undergo routine screening for the HCV, these results are difficult to interpret and are inherently biased.

#### 3.4. Homeless Children

A homeless child is a child who does not have a nighttime residence or resides in a homeless shelter or temporary housing. One study involved 386 homeless children...
and found the prevalence of HCV among these children to 
be 1% (36) (Table 1). There were no data for HCV prevalence 
among homeless adults in Isfahan. The low rate of HCV in 
homeless children may be due to the fact that children are 
less likely to engage in high-risk activities that would pre-
dispose them to the HCV.

3.5. The Prevalence of HCV Among Others Groups

Thirteen studies (33-45) related to the prevalence of 
HCV in Isfahan province were found to include other pop-
ulations (Table 1). The smallest and the largest sample sizes 
were 73 and 616 for hemodialysis and thalassemic patients, 
respectively. Reported HCV prevalence ranged from 0% for 
laboratory healthcare workers to 80.5% for hemophilic pa-
tients. One study reported no cases of the HCV among 203 
laboratory healthcare workers (42).

Patients undergoing chronic hemodialysis are at in-
creased risk for contracting the HCV based on the length 
of time patients receive dialysis and the number of blood 
transfusions they receive (49). In one study, the preva-
ience of HCV among 73 hemodialysis patients was found 
to be 8.2% (46). Similarly, patients with hemophilia are 
blood transfusion dependent and are at an increased risk 
for HCV infection. Four studies were found that measured 
the prevalence of the HCV in hemophilic patients, which 
ranged from 22.6% to 72.0% (34, 41, 43, 46).

4. Discussion

HCV infection is a major public health concern in many 
countries, particularly in developing nations. There is no 
vaccine and no post-exposure prophylaxis for the HCV; 
therefore, in many countries, preventive strategies are 
based on healthcare policy. More attention is often paid 
to diagnose, screen, and treat high-risk groups rather than 
the general population, which is the basis of preventive 
strategies in Iran (50). The purpose of this study was to pro-
vide an accurate estimate of the HCV disease burden in Is-
fahan, including among those in high-risk groups. The re-
sults indicated that the infection may be more prevalent 
than previously thought and underscores the importance 
of more comprehensive studies among people at a high 
risk for contracting chronic HCV infections.

One of the transmission routes of the HCV is through 
blood transfusions. In Iran, a blood donor screening pro-
gram was implemented in all Iranian blood transfusion 
centers in 1996 (14). Some studies on the prevalence of 
HCV infection have shown that the rate was significantly 
lower after this program was enacted, compared to pre-
vious blood screening methods (51). One of the main 
causes of improvement in Iran is the screening process and 
the elimination of high-risk donors. The present research 
showed an increase in the prevalence of the HCV from 1996 
to 2001, during which time blood donors were referred to 
the Kashan blood bank (19). In contrast, from 2004 to 2008, 
Ebrahimian et al. (24) reported a decline in the prevalence 
of the HCV among blood donors referred to the Isfahan 
blood transfusion organization. The prevalence of anti-
HCV antibodies among blood donors was 0.12% and 0.5% 
in Tehran and Babol, respectively (52). This is much lower 
than the prevalence rate of the HCV among blood donors in 
some developing countries, which ranges between 1% and 
7% (53-56). Reasons for lower prevalence rates in Iran may 
be due to better trained healthcare staff, increased non-
remunerated repeat donors, better supply of instruments 
and laboratory equipment for suitable blood transfusion, 
routine screening for the HCV using sensitive screening 
kits, and the establishment of donor deferral criteria.

Intravenous drug users not only have the highest 
prevalence of HCV infection but also constitute a potential 
reservoir for the HCV in the community. In the de-
veloped world, IDU is the primary mode of transmission 
for HCV infection (5). A systematic review showed a preva-
ience of HCV infection in drug user populations ranging 
from 1.9% - 100% (57). A number of recent studies have as-
essed HCV prevalence in drug users in Iran, which ranges 
from 11.2% - 88.9% (58-60). Based on this high prevalence, 
IDU plays an important role in the transmission of HCV in-
fecion. Therefore, harm reduction programs should be 
considered to control and decrease the spread of the HCV 
among drug users. Additionally, an understanding of HCV 
prevalence in each local high-risk population will be im-
portant to decision-making about appropriate strategies.

Prevalence of the HCV among hemophilic patients is 
high throughout Isfahan province. In the different 
cities and provinces of Iran, the prevalence of HCV ranges 
from 15.6% - 83.3%, with the highest rate being found in 
Tehran and the lowest in Fars (61-63). The prevalence of 
the HCV in thalassemic patients in Isfahan province de-
creased from 2004 (34) to 2011 (41), but the current preva-
ience rate among Iranian thalassemic patients is between 
15.7% - 63.8% (64, 65). Although HCV infection is a signif-
icant issue among patients with congenital bleeding dis-
orders who need to receive blood products, research has 
shown that the rate of infection is higher in patients with 
hemophilia because of the frequent use of blood prod-
ucts (41). Some Iranian healthcare policies have focused 
on screening transfused blood that is used for hemophilic 
and thalassemic patients to help maintain or decrease the 
prevalence of HCV infection (50).

A number of limitations to this study must be consid-
ered. First, estimates are based on cross-sectional studies 
that may not be representative of each respective group.
Second, conclusions regarding the prevalence of chronic HCV infections were unable to be obtained because many studies did not include information on HCV RNA levels. Similarly, some studies did not confirm anti-HCV positivity with a confirmatory RIBA test while others did. The RIBA data were used, when available; thus, a number of false positives could be present in this study’s dataset. Additionally, viable studies that investigated the prevalence of the HCV in hospitalized patients were not available.

Despite these limitations, this study demonstrates the significant role that IDU plays as the main contributor to HCV infection in Iran. To combat this, effective harm reduction programs should be implemented to prevent new HCV infections. Considering the high prevalence of HCV infection among HIV patients, healthcare policy makers should pay more attention to this group, in particular.

Footnote

Authors’ Contribution: Study concept and design: Zary Nokhodian; analysis and interpretation of data: Mohsen Janghorban; study supervision: Behrooz Ataei, Farzin Khorvash.

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