Hepatitis Monthly 2008; 8(2): 141-146

BRIEF REPORT

Seroepidemiology of Hepatitis C in Kermanshah (West of Iran, 2006)

Babak Sayad [1*], Fatemeh Shamsedin Saeed [1], Hossein Keyvani [2], Mansour Rezaii [3], Tannaz Asadi [1], Siavash Vaziri [1], Alireza Janbakhsh [1], Feyzollah Mansouri [1], Mandana Afsharian [1], Zahra Laghaii [1]

[1] Liver Diseases and Hepatitis Research Center, Department of Infectious Diseases, Imam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran

[2] Department of Virology, Iran University of Medical Sciences, Tehran, Iran

[3] Department of Biostatistics and Epidemiology, Kermanshah University of Medical Sciences, Kermanshah, Iran

Background and Aims: **Chronic and serious outcomes of hepatitis C virus (HCV) infection impose a remarkable economic burden to the health system. The aim of this study was to evaluate the prevalence of HCV infection in the general population of Kermanshah in the year 2006.**

Methods: **In this cross-sectional study, 1721 residents from Kermanshah were chosen by systematic and cluster sampling in the year 2006. After interview, serum samples were taken and evaluated for HCV-Ab using ELISA method (3rd generation). Positive samples were confirmed by Western Blot (WB) and PCR if necessary.**

Results: **The prevalence of HCV was 0.87% (male: 1.4% vs. female: 0.3%). There was 88.2% coordination between ELISA and WB results. Statistical relationship was observed between HCV infection and male sex (P<0.018), history of addiction (P<0.0001), shared needle (P<0.0001), unsafe sexual contact (P<0.008), history of blood and blood products transfusion (P<0.0001), tattooing (P<0.0001), history of incarceration (P<0.0001), and hemophilia (P<0.0001). On the other hand, stepwise logistic regression analysis showed that hemophilia, shared needle, IV addiction, transfusion and addiction were the most important risk factors for HCV infection in a descending order. The rate of HCV infection increased in cases with multiple risk factors.**

Conclusions: **We estimate that among 967196 people, who live in Kermanshah, nearly 8400 individuals may have HCV infection and this will be a major problem in the near future. Addicts especially IV drug users and cases with the history of blood and blood products transfusion are high risk groups who need special attention regarding HCV infection.**

Keywords: **Hepatitis C, Seroepidemiology, Kermanshah, Iran**

Chronic viral hepatitis is the fifth cause of mortality in the world. It mainly results from hepatitis B virus (HBV) and hepatitis C virus (HCV) infections. This disease can result in critical outcomes such as cirrhosis, portal hypertension and hepatocellular carcinoma that impose a significant economic burden to the health system. Although IV addiction is the most important route of HCV acquisition, other routes of transmission such as sexual contact, contaminated blood transfusion and maternal route can result in disease spread from infected persons to others [1, 2].

HCV infection has an old world distribution in comparison with HIV infection. It is estimated that about 170 million contaminated cases are in the world. The prevalence of HCV infection in the

**** Correspondence:***
Babak Sayad, M.D., Liver Diseases and Hepatitis Research Center, Imam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran.

Tel: *+98 831 8350034*
Fax: *+98 831 8377734*

E-mail: *babaksayad@yahoo.com*

Received: *27 Dec 2007* ***Revised:*** *4 Apr 2008*
Accepted: *10 May 2008*

Hep Mon 2008; 8 (2): 141-146

general population of developed countries is 1-2% and less than 0.5% in blood donors [3]. Three different epidemiologic patterns of HCV infection are as follows: 1) in countries such as the USA and Australia, most of the HCV infection cases are between 30-49 year old people. It indicates that the majority of HCV transmission has occurred in recent years, initially among young adults who are drug users. 2) In areas such as Japan or southern Europe, the highest prevalence of HCV infection is among older persons. In these countries, health related procedures; especially unsafe injections and traditional medical treatments, may play the main role in virus transmission. 3) In countries such as Egypt, high incidence of infection is seen in all age groups that points to continual acquisition routs of HCV infection [2-6].

In Iran, studies on the prevalence of HCV infection in general population have been mainly limited to the high risk groups. It seems that the prevalence of hepatitis C in general population is less than 1%, which is much lower than most of the regional countries [7]. In the first report that appeared in the literature in 1994, Rezvan et al. from Iranian Blood Transfusion Organization reported that 0.3% of blood donors in Tehran had positive anti-HCV antibody [8]. Recently, a study on 5976 blood donors in Rasht, northern part of Iran, showed that 0.5% of the cases had positive HCV-Ab [9]. In another study, the prevalence of HCV in hemodialysis patients of Kermanshah was 26.4% [10]. The prevalence and distribution patterns of HCV infection in the society are the first steps for planning control programs for it. Therefore, we decided to evaluate the seroepidemiology of hepatitis C in the city of Kermanshah, west of Iran with a population of 967196 people, using the most sensitive and reliable laboratory methods.

This descriptive cross-sectional study was done on 1721 residents of Kermanshah with an age range of 15-64 in March 2006. Cases were chosen by systematic and cluster sampling in 144 clusters, each containing 12 persons. City blocks were chosen incidentally using a city map and then 144 clusters were selected for participating in this study. Data was collected through observation and interview. After coordination with educated skilful questioner, blood samplers and the laboratory of Imam Khomeini Hospital for the reception of the samples, the teams were sent to the city. After interviewing with persons who were selected incidentally using cluster sampling method, blood samples were taken. Persons who did not want to interview, complete the questionnaire or donate blood were excluded and other same sex and same age cases were included from the neighborhood.

Totally, 1796 blood samples were collected and divided to 1721 cases in the main group and 75 cases in the reserve group. If the main samples were unusable for any reason, reserved samples were substituted. After sampling in 5cc tubes containing EDTA, samples were sent to the laboratory of Imam Khomeini Hospital in cold boxes as soon as possible. Following serum separation, samples were frozen at -20°C and then sent to Keyvan Virology Laboratory in Tehran within 20 days with attention paid to the cold chain. Primarily, the Spanish 3rd generation ELISA kit was used. Positive samples reevaluated with the German diagnostic kit. If the latter was positive, HCV infection was confirmed. If the report of Western Blot (WB) was indeterminate, PCR method using American Amplicor Apparatus was performed for confirmation or rejection of HCV infection. Finally, data from the questionnaires and blood test results was analyzed with SPSS 11.5 using chi-square, Pearson and Fischer's exact tests.

Prevalence & sex distribution

Among 1721 evaluated persons, 17 cases had positive HCV-Ab using ELISA. Among them, 14 cases were positive, 1 case was indeterminate and 2 cases were negative for HCV-Ab using WB. PCR was positive on the indeterminate sample. Totally, 15 cases had HCV infection. According to these results, the prevalence of hepatitis C in Kermanshah was calculated to be 0.87%. Because 15 cases out of 17 positive ELISA samples were confirmed by WB and PCR, there was 88.2% coordination between ELISA and these confirmatory methods. Among the total of 1721 cases, there were 854 (49.6%) males and 867 (50.4%) females (M/F: 0.99). In 854 males, there were 12 HCV infected cases and in 867 females, only 3 cases of HCV infection were found. There was a statistically significant relationship between male sex and HCV infection (P<0.018).

Age & occupational distribution

There were 1025 (59.6%) persons under the age of 35 and 696 (40.4%) persons above it. Among cases under 35 years of age, 8 (0.8%) persons and among cases above 35, 6 (0.9%) persons had HCV infection. There was no statistically significant relationship between age groups and HCV infection (P<0.86). Five persons (0.29%) from the total of 1721 cases had high risk jobs (nurse, dentist, physician, etc.) but none of them had HCV infection. The highest prevalence of HCV positive cases were observed in the workers group.

Marital status & education level distribution

There were 1058 (61.5%) married, 625 (36.3%) single and 38 (2.2%) divorced cases. Nine (0.85%)

married and six (0.96%) single persons had HCV infection. There was not a statistically significant relationship between marital status and HCV infection (P<0.94). Most of the cases had junior high school and high school diploma (54.7%). The highest prevalence of HCV infection was observed in persons who had primary school education (4 cases, 1.29%). There was no statistically significant relationship between educational level and HCV infection (P<0.495).

Addiction & alcohol consumption history

Among all cases, 2.7% did not answer the question about addiction history while eighty-nine cases (5.2%) gave positive answers. Among 89 persons with an addiction history, there were eight cases (9%) of HCV infection. A statistically significant relationship was observed between addiction history and HCV infection (P<0.0001). Twelve addicts (13.5%) had a history of injection. Six cases of IV drug users (50%) Vs. two cases of non IV drug addicts (2.6%) had HCV infection. There was a statistically significant relationship between route of drug use and HCV infection in addict persons (P<0.0001). Among 12 IV drug users, 3 cases (25%) had a history of sharing needles; they all had HCV infection compared to 33% of IV drug users without a shared needle history. There was a statistically significant relationship between sharing needles and HCV infection (P<0.0001). Among the studied cases, 72 (4.2%) did not answer the question about alcohol consumption history while 196 persons (11.4%) gave a positive answer. Six cases (3.1%) with positive alcohol consumption history and six cases (0.4%) without this history had HCV infection. There was a statistically significant relationship between alcohol consuming and hepatitis C infection (P<0.0001).

Unsafe sexual contact & blood transfusion history

Among evaluated persons, 351 cases (20.4%) did not answer the question about unsafe sexual contact history while 15 cases (0.9%) gave positive answers. Two of the 15 cases (13.3%) who had unsafe sexual contact vs. 11 of 1355 cases (0.8%) who did not have unsafe sexual contact had HCV infection. There was a statistically significant relationship between unsafe sexual contact history and HCV infection in cases who answered this question (P<0.008). Among studied cases, 95 persons (5.5%) had a history of blood and blood products transfusion and 6 of them (6.3%) had HCV infection compared to 9 cases out of those who did not have a blood and blood products transfusion history (0.6%). There was a statistically significant relationship between blood and blood products transfusion and HCV infection (P<0.0001).

Surgical, tattooing & incarceration history

Among evaluated persons, 587 (34.1%) cases had undergone at least one surgery and 7 of them (1.2%) had HCV infection compared to eight of 1134 cases without a surgical history (0.7%). There was no statistical significant relationship between surgery and HCV infection (P<0.303). In this study, 7 persons (3.8%) out of 182 cases with tattoos had HCV infection versus 8 of 1539 cases (0.5%) without tattooing. There was a statistically significant relationship between tattooing and HCV infection (P<0.0001).

Among evaluated cases, 50 persons (2.9%) did not answer the question about having a history of incarceration but 70 cases (4.1%) gave positive answers. Seven cases with the history of incarceration (10%) Vs. 7 cases with no incarceration history (0.4%) harbored HCV infection. There was a statistically significant relationship between incarceration history and HCV infection in persons who had answered this question (P<0.0001).

Underlying diseases, dentistry & jaundice history

In our study, 2 cases (0.1%) were thalassemic, 1 case (0.06%) was under hemodialysis and 2 cases (0.1%) had kidney transplant with no HCV infection among them. Totally, 2 cases (0.1%) were hemophilic and both of them had HCV infection. There was a statistically significant relationship between hemophilia and HCV infection (P<0.0001). Among 1298 cases with dental intervention history, 11 persons (0.8%) had HCV infection. No statistically significant relationship was observed between dental intervention and HCV infection (P<0.526).

In our study 86 cases (5%) had a history of jaundice in their life and among them 6 persons (7%) had HCV infection. There was a statistically significant relationship between jaundice and HCV infection (P<0.0001). Among studied persons, 218cases (12.7%) had a history of jaundice in their family and 1 of them (0.5%) had HCV infection. No statistically significant relationship was observed between jaundice in family and HCV infection (P<0.415).

Number of risk factors & frequency of HCV infection

The occasions that signified statistically, were

selected as the risk factors for acquisition HCV infection. Among evaluated cases, some persons had more than one risk factor. According to this fact, all studied cases were evaluated considering the number of risk factors and HCV infection rate and the results are shown in Table 1. Considering these calculations, it was observed that with an increase in the number of risk factors, the frequency rate of HCV infection also increased (Figure 1). They had a defective direct correlation with a statistically significant relationship (P<0.0001).

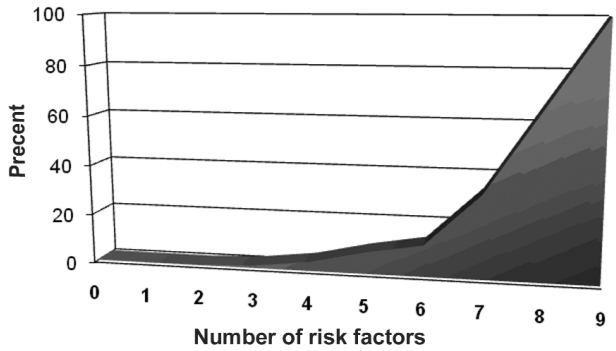

Figure 1. HCV infection rate according to the number of risk factors.

Considering multiple risk factors that yielded statistically significant results in univariate analysis, multivariate analysis was performed according to the probable confounding bias. Among 10 risk factors confirmed by univariate analysis, only five of them gave statistically significant results in multivariate analysis which, in a descending order, are as follows: hemophilia, shared needle, IV addiction, blood transfusion and addiction. More details are shown in Table 2.

In our study, among a total of 1721 evaluated cases, 15 persons had HCV infection. Therefore, the overall prevalence of infection was 0.87% (95% CI: 0.83-0.90). The prevalence of hepatitis C has significant differences in different areas of the world. In previous studies, the prevalence of HCV infection in the general population of the developed countries was 1-2% [1], in the general population of Taiwan was 9% [11], in blood donors of Iran was 0.2-1.5% [12] and in volunteer blood donors of Shiraz was 0.59% [13]. HCV infection prevalence in the general population of Gabon was 6.5% [14] and in healthy blood donors of India was 2.4% [15]. Therefore the prevalence of HCV infection in this study is less than most of the developing countries and is similar to developed and European countries. Considering the population in Kermanshah and the prevalence of HCV infection, it is estimated that 8400 HCV infected persons are in Kermanshah. Because 85% of HCV infected cases become chronic, if the infected cases are not diagnosed and treated timely, we must be prepared for the management of at least 7400 patients with cirrhosis or hepatocellular carcinoma in 2-3 decades. In our evaluation, there was 88.2% agreement between results of the 3rd generation ELISA method and confirmatory WB test. Therefore, using ELISA kits (3rd generation) in our study showed a good quality and sensitivity.

Evaluation of the relationship between different factors and the frequency of HCV infection correlating other studies is discussed in detail and separately as follows: As explained previously, there are three epidemiologic patterns in HCV prevalence according to the age of cases throughout the world [2-6]. In our study, a statistically significant relationship was not observed between HCV infection and age which correlates with the pattern of infection in the third group like the pattern of infection in Egypt. In one study in

Table 1. Frequency of risk factors (simple, relative and cumulative) considering HCV infection.

Number of risk factors	Number of cases	Percent	Cumulative percent	Number of HCV infections	Ratio of HCV infection
0 risk factor	281	16.33	16.33	1	0.36
1 risk factor	690	40.09	56.42	2	0.29
2 risk factors	480	27.89	84.31	1	0.21
3 risk factors	178	10.34	94.65	2	1.12
4 risk factors	54	3.14	97.79	2	3.70
5 risk factors	23	1.34	99.13	2	8.70
6 risk factors	8	0.46	99.59	1	12.50
7 risk factors	3	0.17	99.77	1	33.33
8 risk factors	3	0.17	99.94	2	66.67
9 risk factors	1	0.06	100.00	1	100.00
Total	1721	100		15	0.87

Table 2. Results of multivariate analysis.

Risk factor	Number of cases	Odd ratio	P value
Hemophilia	2	0.008	<0.0001
Shared injection	3	0.006	<0.0001
IV addiction	12	0.005	<0.0001
Blood transfusion	95	0.004	0.004
Addiction	89	0.003	<0.0001

Khuzestan (Iran), most of the HCV infected persons were males [16]. In the USA the M/F ratio in HCV infected cases was 2.5/1.2 [1]. In another study, there was no relationship between sex and HCV infection in patients who were under hemodialysis [12]. In our study the frequency of HCV infection was 1.4% in males versus 0.3% in females. Although it yielded statistically significant results in univariate analysis (P<0.018), results were not significant in multivariate analysis. It is suggested that the relationship between male sex and hepatitis C results from higher frequency of risk factors such as IV addiction and unsafe sexual contact in this group as confounding factors.

In our study, there was a statistically significant relationship between HCV infection and addiction versus general population, IV addicted cases vs. non IV addicted cases, IV addicted persons who had shared needles history versus those who had not in both univariate and multivariate analysis (P<0.0001). In two other studies, both IV drug addiction and non IV drug addiction were independent risk factors for hepatitis C [16-18]. In developed countries, most of the new HCV infections are related to IV drug abuse and it is the most common risk factor [1, 3]. There is correlation between our study and other series on these subjects. In this study, the relationship between HCV infection and alcohol consumption was statistically significant in univariate analysis (P<0.0001) but lost its significance in multivariate analysis. According to other studies, alcohol consumption, especially more than 50-125g per day, is suggested as an accelerating factor for the advancement of fibrosis in patients with chronic hepatitis C [1, 2, 5] but there are not any studies about the relationship between HCV infection and alcohol in the literature.

In our study, the relationship between HCV infection and unsafe sexual contact was statistically significant in univariate analysis (P<0.0001) but no relationship was detected in multivariate analysis. In some studies, having unsafe sexual contact is suggested as one of the HCV transmission routs although it is not the most common rout [1-3, 16, 18]. There was a statistically significant relationship between HCV infection and blood and blood products transfusion in both univariate (P<0.0001) and multivariate analysis (P=0.004). In other studies, similar relationships were approved in thalassemic persons [19] and patients under hemodialysis [12, 20]. Blood transfusion from donors who are not screened is supposed to be an important risk factor for HCV transmission [1-5]. In this study, the relationship between HCV infection and tattooing was statistically significant in univariate analysis (P<0.0001) but lost its significance in multivariate analysis. Two investigations correlate with our study on this subject in hemodialyzed patients [12, 20] but in other studies, tattooing has been suggested as a risk factor for HCV transmission [1-6].

In our study, the relationship between HCV infection and incarceration was statistically significant in univariate analysis (P<0.0001) but not in multivariate analysis. In the USA, 20-40% of prisoners have HCV infection and hepatitis C has a high prevalence in the prisoners of California, Maryland and Texas [3]. There was a statistically significant relationship between HCV infection and hemophilia in both univariate (P<0.0001) and multivariate analysis (P<0.0001). In others studies, hemophilic patients belong to high risk groups for HCV infection (1-5). There is correlation between our study and other series on this subject. It is supposed that the high prevalence of HCV infection in hemophilic patients is related to the ELISA kits with a low sensitivity in screening blood. There were not any statistically significant results in the univariate and multivariate analysis on the relationship between HCV infection and occupation, marital status, educational level, history of surgical and dental procedures, hemodialysis and kidney transplantation.

According to the previous sections, the results of this study consist of: 1) In Kermanshah, the prevalence of HCV infection in the general population is estimated to be 0.87% (95% CI: 0.83-0.90) which is almost similar to developed nations. But according to its age distribution (it was observed in all age groups in our study), it differs from them. This difference could be the result of continual acquisition rout of infection. 2) The most important risk factors of HCV infection in a descending order are as follows: hemophilia, shared injection, IV addiction, blood transfusion and addiction history. 3) In patients who have more than one risk factor, there is an increasing chance of HCV infection according to the number of risk factors. Considering the chronicity and remarkable economic burden to the health care system for managing such patients, preventive cares should be the mainstay of control programs for this infection. Screening the high risk groups for HCV infection is an important rout for detecting HCV infected cases in the general population.

References

1. Dienstag JL. Chronic viral hepatitis. In: Mandell GI, Bennet JE, Dolin R, eds. *Principle and Practice of Infectious Diseases*. 6th ed. Philadelphia: Elsevier 2005: 1441-64.
2. Dienstag JL, Isselbacher KJ. Chronic hepatitis. In: Kasper DL, Braunwald E, Fauci AS, eds. *Harrison's Principles of Internal Medicine*. 16th ed. New York: Mc Graw-Hill 2005: 1844-55.
3. Thomas DL, Ray SC, Lemon SM. Hepatitis C virus. In: Mandell GI, Bennet JE, Dolin R, eds. *Principle and Practice of Infectious Diseases*. 6th ed. Philadelphia: Elsevier 2005: 1950-81.
4. Hamilton BC. Hepatitis C virus. In: Sleisenger P, Fordtan S, eds. *Gastrointestinal and Liver Diseases: Pathophysiology, Diagnosis & Management*. 1st ed. New York: Academic Press 2002: 1-20
5. Alter MJ, Hutin YJ, Armestrong GL. Epidemiology of hepatitis C. In: Liang TL, Hoofnagle JH, eds. *Biomedical Research Reports of Hepatitis C*. 1st ed. New York: Academic Press 2002: 169-83.
6. Lidsay KL, Hoofnagle JH. Chronic hepatitis. In: Goldman L, Ausiello D, eds. *Cecil Text Book of Medicine*. 22th ed. Pennsylvania: Saunders 2004: 921-2.
7. Alavian SM, Adibi P, Zali MR. Hepatitis C virus in Iran: Epidemiology of an emerging infection. *Arch Iranian Med* 2005; **8**: 84-90.
8. Rezvan H, Ahmadi J, Farhadi M, Taroyan S. A preliminary study on the prevalence of anti-HCV amongst healthy blood donors in Iran. *Vox Sang* 1994; **67**: 100.
9. Ansar MM, Kooloobandi A. Prevalence of hepatitis C virus infection in thalassemia and haemodialysis patients in north Iran-Rasht. *J Viral Hepat* 2002; **9**: 390-2.
10. Sabur B, Borumand P, Mehrabi Y. Evaluation of prevalence rate and distribution of the predisposing factors of hepatitis C in hemodialysis patients in Kermanshah province (1999-2000). *Behbood J* 2003; **27**: 60-6.
11. Hung KYU, Chen WY, Yang CS, Lee S, Wu D. Hepatitis B and C in hemodialysis patients. *Dial Transplant J* 1995; **24**: 135-42.
12. Sabur B, Broumand P, Mehrabi YL. Evaluation of prevalence and distribution of risk factors for hepatitis C in hemodialysed patients at Kermanshah province during 1999-2000. *Behbood J* 2003; **18**: 60-5.
13. Karimi M, Ghavanini AA. Seroprevalence of HBsAg, anti-HCV, and anti-HIV among haemophiliac patients in Shiraz, Iran. *Haematologia* 2001; **31**: 251-5.
14. Perret JL, Moussavou-Kombila JB, Delaporte E, Pemba LF, Boguikouma JB, Matton T, et al. HBs Ag and antibodies to hepatitis C virus in complicated chronic liver disease in Gabon. A case control study (in French). *Gastroenterol Clin Biol* 2002; **26**: 131-5.
15. Baheti R, Gehlot RS, Baheti R. Seroprevalence of anti HCV Ab in healthy voluntary blood donors and in high risk individuals. *J Indian Acad Clin Med* 2000; **1**: 36-47.
16. Hajiani E, Hashemi J, Masjedizadeh R, Shayesteh AA, Idani E, Rajabi T. Seroepidemiology of hepatitis C and its risk factors in Khuzestan Province, south-west of Iran: a case-control study. *World J Gastroenterol* 2006; **12**: 4884-7.
17. Alavian SM, Ahmadzad M, Keshvari M. Efficacy and safety of Interferon-alpha (PDferon B) and Ribavirin combination therapy in patients with chronic hepatitis C in Iran. H*ep Mon* 2006; **6**: 11-8.
18. Alavian SM, Gholami B, Masarrat S. Hepatitis C risk factors in Iranian volunteer blood donors: a case-control study. *J Gastroenterol Hepatol* 2002; **17**: 1092-7.
19. Saberi-Firoozi M, Yazdankhah S, Karbasi HT. Anti-HCV seropositivity among multiply transfused patients with B-thalassemia major in southern Iran. *Irn J Med Sci* 1996; **21**: 59-67.
20. Alavian SM, Einollahi B, Hajarizadeh B, Bakhtiari S, Nafar M, Ahrabi S. Prevalence of hepatitis C virus infection and related risk factors among Iranian haemodialysis patients. *Nephrology* 2003; **8**: 256-60.