

Prevalence and risk factors of hepatitis B and C viruses among hemodialysis patients in Isfahan, Iran

Hamid Kalantari, Shahram Ebadi¹, Majid Yaran², Mohammad R. Maracy³, Zahra Shahshahan⁴

Department of Gastroenterology, Isfahan Liver Disease Research Center, ¹Department of Internal Medicine, School of Medicine, ²Department of Infectious Diseases, Infectious Diseases and Tropical Medicine Research Center, ³Department of Epidemiology and Biostatistics, School of Public Health, ⁴Department of Obstetrics and Gynecology, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Background: The aim of this study was to assess the prevalence of hepatitis B virus (HBV) and hepatitis C virus (HCV) and their associated risk factors among hemodialysis patients in Isfahan, Iran in 2011.

Materials and Methods: In this cross-sectional study, a total of 499 chronic hemodialysis patients from eight governmental hemodialysis centers were tested. Demographic information, time duration on hemodialysis, history of blood transfusion, and the number of transfused blood units as risk factors to HBV and HCV infections were calculated. The status of HBsAg and anti-HCV was assessed by serological testing.

Results: The overall prevalence of HBV-positive and HCV-positive among study population was 1.2% and 5.2%, respectively. Age, sex, and time duration on hemodialysis were not statistically significant in HBV- and HCV-patients compared with other hemodialysis patients ($P > 0.05$). History of blood transfusion and the number of transfused blood units in HBV infected patients were similar to other patients ($P > 0.05$). The main risk factors in hemodialysis patients infected by HCV were history of blood transfusion and the number of transfused blood units ($P < 0.0001$).

Conclusion: In conclusion, the prevalence of HBV and HCV infections in hemodialysis centers in Isfahan is lower than in some other cities of Iran. History of blood transfusion and the number of blood units transfused might be a risk factor for HCV gaining. However, further studies are needed to assess the role of other demographic and clinical risk factors in these patients.

Key Words: Hemodialysis, hepatitis B virus, hepatitis C virus

Address for correspondence:

Dr. Zahra Shahshahan, Department of Obstetrics and Gynecology, Isfahan University of Medical Sciences, Isfahan, Iran. E-mail: shahshahan@med.mui.ac.ir

Received: 19.09.2012, Accepted: 06.11.2012

INTRODUCTION

In recent decades, the use of hemodialysis has been

expanded increasingly for end-stage renal disease. The modality of this treatment has led to the increased longevity of patients. It also predisposes these patients to some infections, mainly blood born viruses.^[1,2] Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections have wide range in prevalence rates in different regions of the world, ranging from 1% in the UK to more than 90% in Eastern Europe in hemodialysis patients.^[3] HBV and HCV infections are the most causes of liver disease in hemodialysis patients and play an important role in serious morbidity and mortality among hemodialysis patients.^[3-5] The

Access this article online	
Quick Response Code:	Website: www.advbiores.net
	DOI: 10.4103/2277-9175.125869

Copyright: © 2014 Kalantari. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

How to cite this article: Kalantari H, Ebadi S, Yaran M, Maracy MR, Shahshahan Z. Prevalence and risk factors of hepatitis B and C viruses among hemodialysis patients in Isfahan, Iran. Adv Biomed Res 2014;3:73.

prevalence of chronic HBV Ag positivity among hemodialysis patients in Arab countries varies from 2% in Morocco to 11.8% in Bahrain.^[5-8] In addition, the prevalence of HCV antibodies among hemodialysis patients in these countries has been reported to range from 27% to 75%.^[9-12] In hemodialysis patients in Iran, the prevalence of HCV is higher than in healthy population (5-24% versus 0.3, respectively); whereas, among countries and in hemodialysis patients, it varies from 2.6% to 22.9%.^[13] Such factors in dialysis patients including blood transfusion, duration of hemodialysis mode of dialysis, prevalence of HCV infection in the dialysis unit, previous organ transplant, intravenous drug use, masculinity, being older, previous HBV infection and nosocomial transmission of HCV in hemodialysis patients units and partial immunosuppression have been associated with an increased risk for infection.^[7,14-16] Some reports demonstrated that the duration of hemodialysis is an independent predictor of HCV infection in chronic hemodialysis patients.^[13,17,18] The increase in prevalence of hepatitis C varies from an average of 12% of patients under dialysis for less than 5 years to 37% of patients under treatment for more than 5 years.^[13]

Increase in morbidity and mortality rates, transmission of infection to other patients and/or staff and progression of liver disease in pretransplant or posttransplant immunosuppressed recipients are important points of view, showing that more attention has to be paid to HBV and HCV infections in dialysis patients.^[16] This study aimed to assess the prevalence of HBV and HCV infections and the risk factors for transmission of viral hepatitis B and C among hemodialysis patients in Isfahan, Iran.

MATERIALS AND METHODS

In this cross-sectional study, during October, 2010 and March, 2011, a total of 499 chronic hemodialysis patients were tested. Patients were selected by cluster sampling from eight governmental hemodialysis centers in Isfahan, Iran. Patients at any age and sex who were under hemodialysis treatment in studied hemodialysis centers were eligible. The participating patients were explained about and informed of the purposes of the study and written informed consent was obtained from them all. The present study was investigated and approved in Isfahan University of Medical Sciences. Patients with history treatment or under treatment of hepatitis and who refused to sign the informed consent were excluded from the study.

Data collected included demographic information (age and sex), time duration on hemodialysis, history of blood transfusion, and the number of transfused blood units as

risk factors to HBV and HCV infections. A close ended and multiple choice-based questionnaire was completed by the researcher via patient interview to ensure proper data collection and prevent any misunderstanding.

Patients, HBsAg and anti-HCV antibody status was assessed by serological testing. Five milliliters of blood was drawn from each patient in plain tube, prior to dialysis, to prevent the interference of heparin with downstream applications. Anti-HBC and anti-HCV antibodies were assessed using third generation enzyme linked immunoassay kit (ULTRA kit, bioMérieux, France).

Qualitative PCR (AmpliSens, Russia for HBV and QIAGEN, Germany for HCV) was conducted on positive samples for HBsAg and anti-HCV Ab.

Data were analyzed using the SPSS-20 software. Variables were presented as Mean \pm SD, Median [IQR] and number (percent). Considering the number of HBV Ag positive patients (six patients), nonparametric Mann–Whitney U test was used to compare the age, time duration on hemodialysis and the number of transfused blood units. In patients with HCV positive, Independent Sample *t*-test was used to compare the age and time duration on hemodialysis. In addition, sex and history of blood transfusion were assessed using Chi-square test for both HCV and HBV patients. *P* value less than 0.05 was considered to be statistically significant.

RESULTS

The participants' ages ranged from 25 to 73 years, and the mean age of all patients was 52.3 ± 12.8 years. Of 246 patients studied, 196 (39.3%) were female and 303 (60.7%) were male. The mean time duration on hemodialysis for all patients was 22.8 ± 9.6 months and 181 (36.3%) of all patients had history of blood transfusion. The overall prevalence of positive HBV Ag was 1.2% (6 of 499 patients) and positive anti-HCV was 5.2% (26 of 499 patients) among hemodialysis patients in studied population. HCV genotyping showed that the most prevalent subtype was I (24 patients) followed by two patients with genotype II.

Table 1 shows age, sex, and some risk factors for HCV-positive patients. Analysis showed that there was no statistically significant relationship between HBV infection and age, sex, and time duration on hemodialysis ($P > 0.05$). Risk factors with a statistically significant relation were the history of blood transfusion ($P < 0.0001$) and the number of transfused blood units ($P < 0.0001$). Among HCV-positive patients, 72% had history of blood

transfusion; while, for HCV negative patients, it was 34.8%. All of HCV infected patients in study population were HCV negative before the dialysis.

Analysis of risk factors in HBV-positive patients showed that there was no statistically significant relationship between HBV infection and age, sex, time duration on hemodialysis, history of blood transfusion, and the number of transfused blood units ($P > 0.05$). Among HBV-positive patients, two patients had history of blood transfusion in which viral marker was positive before needing hemodialysis [Table 2].

Based on the evaluation of virus load in HCV and HBV-positive patients, 24 (4.8%) of them had low viral load ($< 2 \times 10^4$) and in other 5 patients, the virus was not detectable.

DISCUSSION

The results of the present study, conducted with the aim of investigating the prevalence of HBV and

HCV in 499 hemodialysis patients and risk factors for transmission of viral hepatitis B and C among them, showed that, among hemodialysis patients in studied population, the overall prevalence of HBV and HCV infections was 1.2% and 5.2%, respectively. Age, sex, and time duration on hemodialysis were not statistically significant in HBV and HCV patients compared with other hemodialysis patients. History of blood transfusion and the number of transfused blood units in HBV-infected patients was similar to others. But the only significant relationship in studied patients was observed in hemodialysis patients infected by HCV compared with hemodialysis patients without HCV infection for history of blood transfusion and the number of transfused blood units.

In this study, the prevalence of HCV and HBV infection among hemodialysis patients was lower than that reported in other studies from our country and other regions. In 2003, Alavian *et al.* reported that the prevalence of HCV infection in 838 Iranian hemodialysis patients was found to be 13.2%.^[19] Joukar *et al.*^[20] showed that the prevalence of HCV infection in hemodialysis patients was 11.9% in Guilan and seroprevalence of HBV Ag was 1.4%. The prevalence of HBV in the hemodialysis patients in Khuzestan Province has been reported to be 5.1%.^[21] Another study by Alavian *et al.*^[22] in 2010 showed that HCV infection prevalence in Iranian hemodialysis patients was 7.61%. In a study in Markazi province of Iran, it was reported that the prevalence of HCV in hemodialysis patients was 5.4%,^[23] which is similar to the results of this study. It is reported that in Iranian hemodialysis patients, the prevalence of positive HBV Ag has been decreased from 3.8% in 1999 to 2.6% in 2005.^[22] Similar to this report, our results in 2011 showed a decrease in the prevalence of positive HBV Ag compared with the 2005 report. Vaccination program of HBV, started in 1993 in Iran, seems to be the cause of the decrease in prevalence of positive HBV Ag during the past decade. In addition, it is noticeable that all the participants in this study had been vaccinated against HBV infection.

In accord with the Joukar *et al.*^[20] and Zahedi *et al.*'s^[2] studies, this study results did not show significant differences in regard to age between hemodialysis patients with HBV or HCV infection compared with hemodialysis patients without HBV or HCV infection; whereas, this does not comply with El-Ottol *et al.*'s^[24] study that reported a statistically significant relationship between HBV infection and age of the patients in a way that patients aged less than 40 years were found to be more susceptible to HBV than older patients. The results of El-Ottol *et al.*'s^[24] study, showed that male hemodialysis patients had higher HBV

Table 1: Age, sex, and some risk factors in 499 hemodialysis patients in regard to anti-HCV status

Variables	Total	Anti-HCV		P value
		Positive (n=26)	Negative (n=473)	
Age	52.3±12.8	49.5±15.2	53.5±11.1	0.08*
Sex				
Male	303 (60.7)	16 (61.5)	287 (60.7)	0.9
Female	196 (39.3)	10 (38.5)	186 (39.3)	
Time duration on hemodialysis	22.8±9.6	24.9±7.5	22.7±9.7	0.25*
History of blood transfusion	181 (36.3)	18 (72)	163 (34.8)	<0.0001*
Number of blood units transfused	0 (0-2)	2 (0-4)	0 (0-2)	<0.0001†

Data are mean±SD, Median [IQR] and number (%), P values calculated by *Independent sample t-test, †Chi-square test and ††Mann-Whitney test, HCV: Hepatitis C virus

Table 2: Age, sex, and some risk factors in 499 hemodialysis patients in regard to HVB-Ag status

Variables	Total	HBV-Ag		P value
		Positive (n=6)	Negative (n=493)	
Age	52.3±12.8	48.7±18.5	54.9±12.3	0.22*
Sex				
Male	303 (60.7)	5 (83.3)	298 (60.4)	0.41†
Female	196 (39.3)	1 (16.7)	195 (39.6)	
Time duration on hemodialysis	22.8±9.6	22±9	22.8±9.6	0.9*
History of blood transfusion	181 (36.3)	2 (33.3)	179 (36.8)	0.9†
Number of blood units transfused	0 (0-2)	0 (0-2.5)	0 (0-2)	0.8*

Data are mean ± SD, Median [IQR] and number (%), P values calculated by *Mann-Whitney test and †Chi-square test, HBV: Hepatitis B virus

prevalence, whereas Zahedi *et al.*'s^[2] study showed that male hemodialysis patients had higher HCV prevalence. These results are in disagreement with the results of Joukar *et al.*^[20] study and the present study that showed the same prevalence of HCV and HBV in male and female hemodialysis patients.

In this study no statistically significant relationship was found between HBV and time duration on hemodialysis, this finding was in agreement with a previous report in Iran,^[2,20] Gaza strip,^[24] and Moldavia,^[25] but this was in contrast to another report in Jordan.^[26] Also in agreement with Joukar *et al.*^[20] study, this study results showed no statistically significant relationship between HCV and time duration on hemodialysis, which was in disagreement with the results of Zahedi *et al.*^[2] study.

In accord with previous studies in Kerman^[2] and Jordan,^[26] the prevalence of HBV was not increased significantly by increasing the number of blood units transfused and the history of blood transfusion. But other studies in Gaza strip^[24] and Brazil^[27] do not support this relationship. In addition, based on this study results like the others which have done in Kerman,^[2] Gaza strip,^[24] Brazil,^[27] and the USA,^[28] the prevalence of HCV hemodialysis patients was significantly increased with the number of blood units transfused and the history of blood transfusion.

In this study on hemodialysis patients, some risk factors for the acquisition of HCV and HBV infection have been studied; there was no significant relationship for age, sex, and time duration on hemodialysis in HCV and HBV-positive patients and a significant relationship was just found for blood transfusion in HCV-positive patients. However, these days, viral transmission by this route is limited because of more active screening of donated blood. Therefore, it is important to consider that, in spite of the systematic screening of blood donors, HCV blood transfusion still remains one of the sources of infection transmission and it is suggested that avoidance of blood transfusion, as much as possible, is the most important practical interventions to reduce the HCV exposure rate in our patients on hemodialysis.

CONCLUSION

The results of this study showed that the prevalence of HBV and HCV infections in hemodialysis centers in Isfahan is lower than some other cities in Iran and history of blood transfusion and the number of blood units transfused might be a risk factor for HCV gaining. However, further studies are needed to assess the role of other demographic and clinical risk factors in these patients.

REFERENCES

- Santos MG, Danguilan RA, Que ET, Balmaceda RP, Padilla BS. Prevalence of hepatitis B and hepatitis C in hemodialysis patients. *Nephrology* 1998;4:101-4.
- Zahedi MJ, Darvish Moghaddam S, Alavian SM, Dalili M. Seroprevalence of Hepatitis Viruses B, C, D and HIV Infection Among Hemodialysis Patients in Kerman Province, South-East Iran. *Hepat Mon* 2012;12:339-43.
- Hinrichsen H, Leimenstoll G, Stegen G, Schrader H, Fölsch UR, Schmidt WE. PHV Study Group. Prevalence and risk factors of hepatitis C virus infection in haemodialysis patients: A multicentre study in 2796 patients. *Gut* 2002;51:429-33.
- Arababadi MK, Hassanshahi G, Yousefi H. HBV-DNA in hemodialysis patients infected by HCV. *Saudi J Kidney Dis Transpl* 2009;20:398-401.
- Lopez-Alcorocho JM, Barril G, Ortiz-Movilla N, Traver JA, Bartolomé J, Sanz P, et al. Prevalence of hepatitis B, hepatitis C, GB virus C/hepatitis G and TT viruses in hemodialysis patients. *J Med Virol* 2001;63:103-7.
- Jafarzadeh A, Kazemi Arababadi M, Mirzaee M, Pourazar A. Occult hepatitis B virus infection among blood donors with antibodies to hepatitis B core antigen. *Acta Med Iran* 2008;46:27-32.
- Chan HL, Tsang SW, Leung NW, Tse CH, Hui Y, Tam JS, et al. Occult HBV infection in cryptogenic liver cirrhosis in an area with high prevalence of HBV infection. *Am J Gastroenterol* 2002;97:1211-5.
- Carpenter PA, Huang ML, McDonald GB. Activation of occult hepatitis B from seronegative patient after hematopoietic cell transplant: A cautionary tale. *Blood* 2002;99:4245-6.
- Naman RE, Mansour I, Klayme S, Khalil G. Hepatitis C virus in hemodialysis patients and blood donors in Lebanon. *J Med Liban* 1996;44:4-9.
- Bdour S. Hepatitis C virus infection in Jordanian haemodialysis units: Serological diagnosis and genotyping. *J Med Microbiol* 2002;51:700-4.
- Othman B, Monem F. Prevalence of antibodies to hepatitis C virus among hemodialysis patients in Damascus, Syria. *Infection* 2001;29:262-5.
- Abdulkarim AS, Zein NN, Germer JJ, Kolbert CP, Kabbani L, Krajnik KL, et al. Hepatitis C virus genotype and hepatitis G virus in hemodialysis patients from Syria: Identification of two novel hepatitis C virus subtypes. *Am J Trop Med Hyg* 1998;59:571-6.
- Fissell RB, Bragg-Gresham JL, Woods JD, Jadoul M, Gillespie B, Hedderwick SA, et al. Patterns of hepatitis C prevalence and seroconversion in hemodialysis units from three continents: The DOPPS. *Kidney Int* 2004;65:2335-42.
- Johnson DW, Dent H, Yao Q, Tranaeus A, Huang CC, Han DS, et al. Frequencies of hepatitis B and infections among haemodialysis and peritoneal dialysis patients in Asia-Pacific countries: Analysis of registry data. *Nephrol Dial Transplant* 2009;24:1598-603.
- Mioli VA, Balestra E, Bibiano L, Carletti P, Della Bella S, Fanciulli E, et al. Epidemiology of viral hepatitis in dialysis centers: A national survey. *Nephron* 1992;61:278-83.
- Fabrizi F, Martin P, Dixit V, Bunnapradist S, Dulai G. Hepatitis C virus antibody status and survival after renal transplantation: Meta-analysis of observational studies. *Am J Transplant* 2005;5:1452-61.
- Irish DN, Blake C, Christophers J, Craske JE, Burnapp L, Abbs IC, et al. Identification of hepatitis C seroconversion resulting from nosocomial transmission on a haemodialysis unit: Implications for infection control and laboratory screening. *J Med Virol* 1999;59:135-40.
- Katsoulidou A, Paraskevis D, Kalapothaki V, Arvanitis D, Karayiannis P, Hadjiconstantiou V, et al. Molecular epidemiology of a hepatitis C outbreak in a haemodialysis unit. Multicentre haemodialysis cohort study on viral hepatitis. *Nephrol Dial Transplant* 1999;14:1188-94.
- 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 (Carlton)* 2003;8:256-60.
- Joukar F, Besharati S, Mirpour H, Mansour-Ghanaei F. Hepatitis C and hepatitis B seroprevalence and associated risk factors in hemodialysis patients in Guilan province, north of Iran: HCV and HBV seroprevalence in hemodialysis patients. *Hepat Mon* 2011;11:178-81.

21. Assarehzadegan MA, Shakerinejad G, Noroozkohnejad R, Amini A, Rahim Rezaee SA. Prevalence of hepatitis C and B infection and HC V genotypes among hemodialysis patients in Khuzestan province, southwest Iran. *Saudi J Kidney Dis Transpl* 2009;20:681-4.
22. Alavian SM, Kabir A, Ahmadi AB, Lankarani KB, Shahbabaie MA, Ahmadzad-Asl M. Hepatitis C infection in hemodialysis patients in Iran: A systematic review. *Hemodial Int* 2010;14:253-62.
23. Merat S, Rezvan H, Nouraei M, Jamali A, Assari S, Abolghasemi H, et al. The prevalence of hepatitis B surface antigen and anti-hepatitis B core antibody in Iran: A population-based study. *Arch Iran Med* 2009;12:225-31.
24. El-kader Y El-Ottol A, Elmanama AA, Ayeshe BM. Prevalence and risk factors of hepatitis B and C viruses among haemodialysis patients in Gaza strip, Palestine. *Virology* 2010;7:210.
25. Covic A, Iancu L, Apetrei C, Scripcaru D, Volovat C, Mititiuc I, et al. Hepatitis virus infection in haemodialysis patients from Moldavia. *Nephrol Dial Transplant* 1999;14:40-5.
26. Al Hijazat M, Ajlouni Y. Hepatitis B infection among patients receiving chronic hemodialysis at the Royal Medical Services in Jordan. *Saudi J Kidney Dis Transpl* 2008;19:260-7.
27. Silva LK, Silva MB, Rodart IF, Lopes GB, Costa FQ, Melo ME, et al. Prevalence of hepatitis C virus (HCV) infection and HCV genotypes of hemodialysis patients in Salvador, Northeastern Brazil. *Braz J Med Biol Res* 2006;39:595-602.
28. de Medina M, Ashby M, Schlüter V, Hill M, Leclercq B, Pennell JP, et al. Prevalence of hepatitis C and G virus infection in chronic hemodialysis patients. *Am J Kidney Dis* 1998;31:224-6.

Source of Support: Isfahan University of Medical Science, **Conflict of Interest:** None declared.