



## PREVALENCE AND RISK FACTORS OF HEPATITIS C VIRUS INFECTION AMONG CHRONIC HEMODIALYSIS PATIENTS IN A TERTIARY DIALYSIS CENTER

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### ABSTRACT

#### Introduction:

Hepatitis C virus (HCV) infection is one of the most important concerns in hemodialysis patients globally. The range of infection prevalence in these patients is reported from 3% to 76% in different parts of the world. Hence, this study was aimed to determine the prevalence of HCV infection and its risk factors among chronic hemodialysis patients who were admitted to Amol dialysis center.

#### Methods:

This retrospective study was conducted by using available data and census method on all chronic hemodialysis patients in Amol dialysis center, Amol city, during 2012–2016. Patient's information compliance with ethical aspects was extracted from their medical records including age, gender, duration of dialysis, the frequency of dialysis per week, history of blood transfusion, history of renal transplant, and anti-HCV antibody titer. Data were analyzed using MS Excel 2016 and SPSS 16 software.

#### Results:

Of all the 162 patients, 86 (53%) cases were females, and 76 (47%) were males with a mean age of 60.6± 14.1 years. Positive anti-HCV was observed in 4 (2.4%) of them. Although a significant relationship was observed between the duration of hemodialysis and HCV infection ( $P = 0.001$ ), we did not observe any correlation between gender, age, the number of dialysis per week, history of blood transfusion, and renal transplantation with the development of HCV infection.

#### Conclusion:

Our findings indicate a significant reduction in the prevalence of HCV among hemodialysis patients in Amol center compared to previous years, which seems to be one of the main reasons for this decrease in the use of erythropoietin instead of blood transfusion. The major risk factor for developing an infection in this center is related to the duration of hemodialysis.

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### Introduction

One of the most important global concern in hemodialysis patients is the Hepatitis C Virus (HCV) infection (1). Patients undergoing chronic hemodialysis are at risk for the infection with hepatitis B virus (HBV) and HCV (2, 3), but there is no available vaccine for HCV in contrast with HBV (4). HCV is the most common viral infection among hemodialysis patients which is the cause of chronic liver diseases, and it is usually transmitted through blood transfusion, organ transplantation, and dialysis ward contamination (5, 6).

Previous studies show that the prevalence of HCV in hemodialysis patients in different parts of the world was reported to be in a wide range of 3% to 76% (7-9). Patients with HCV infection often do not have many clinical manifestations for diagnosis

(10). The highest rate of morbidity and mortality is related to HCV infected patients with end-stage renal disease (ESRD) especially after renal transplantation (1).

According to the available reports, it seems that some factors such as duration of hemodialysis, blood transfusion history, and the frequency of blood transfusion can be associated with viral infections (11, 12).

In most studies, it can be seen that Enzyme-Linked Immunosorbent Assay (ELISA) test is used to identify HCV antibodies (13-15). However, it has been reported that HCV infection may occur without detection of antibodies (16-20) and may require polymerase chain reaction (PCR) technique which has been used as a confirmatory test for serological tests in recent years (21, 22).

With regard to the fact that no study has been found on this topic in this dialysis center during recent years, we designed a study on hemodialysis patient with the aim of determining HCV prevalence and its risk factors that are responsible for this infection among patients who were admitted to Amol dialysis center for hemodialysis.

#### Methods:

##### Study design

This retrospective survey was conducted on the available data in Amol dialysis center located in Imam Reza Hospital of Amol city, Mazandaran, Iran. Data were collected during five years from 2012 to 2016.

##### Data collection

One of our team members completed the checklists for all available records of hemodialysis patients in the dialysis ward. The checklist included age, gender, duration of dialysis, the frequency of dialysis per week, history of blood transfusion, history of renal transplant, and anti-HCV antibody titer. All data were obtained from computerized records and manual archives of the hospital.

##### Materials and Devices

The Stat Fax-2100 and the HCV-branded ABON kit were used to detect HCV by enzyme-linked immunosorbent assay (ELISA) technique.

##### Data analysis

First, Microsoft Excel 2016 was used to categorize the extracted data, and for some descriptive statistical calculations, Statistical Package for the Social Sciences 16.0 (SPSS Inc., Chicago, IL, USA) has also been used. Data were analyzed by Mann-Whitney, Fisher's exact test and t-test. Microsoft Excel and Word softwares used to design charts and tables.

##### Ethical considerations

The ethical review committee of Mazandaran University of Medical Sciences approved this study. All information in the dialysis ward archive was used confidentially and exclusively for the aims of this survey to comply with ethical standards. After final review, all records were delivered to the dialysis center without any changes.

##### Results:

Out of 162 samples, 86 (53%) were females, and 76 (47%) were males with a mean age of  $60.6 \pm 14.1$  years. The mean duration of dialysis in these patients was  $2.9 \pm 2.7$  years. The average number of dialysis was 3 ( $2.8 \pm 0.4$ ) times a week. Of all patients, 86 (53%) had a history of blood transfusion, and only 3 (1.8%) of them had a history of renal transplantation. Infection with HCV was seen in only 4 (2.4%) patients. All characteristics are presented in Table 1.

Table 1. Characteristics of patients with hemodialysis (N=162)

|   |        |                 |
|---|--------|-----------------|
| <b>Gender (%)</b>                           | Male   | 76(47)          |
|   | Female | 86(53)          |
|   |        |                 |
| <b>Age (year)</b>                           | Min    | 23              |
|   | Max    | 96              |
|   | Mean   | $60.6 \pm 14.1$ |
| <b>Duration of hemodialysis (year)</b>      | Min    | 0.5             |
|   | Max    | 15              |
|   | Mean   | $2.9 \pm 2.7$   |
| <b>The number of dialysis per week</b>      | Min    | 2               |
|   | Max    | 3               |
|   | Mean   | $2.8 \pm 0.4$   |
| <b>History of blood transfusion (%)</b>     | Yes    | 86 (53)         |
|   | No     | 76 (47)         |
| <b>History of renal transplantation (%)</b> | Yes    | 3 (1.8)         |
|   | No     | 159 (98.2)      |
| <b>HCV Positive (%)</b>                     | Yes    | 4 (2.4)         |

|  |           |                   |
|--|-----------|-------------------|
|  | <b>No</b> | <b>158 (97.6)</b> |
|--|-----------|-------------------|

According to the Mann–Whitney test results which are presented in Table 2, there was a significant difference between the mean age of patients with chronic hemodialysis in both hepatitis and non-hepatitis groups ( $P = 0.25$ ). There was no significant difference between the mean number of dialysis per week in these two groups ( $P = 0.32$ ). There was a significant difference between the mean duration of dialysis in patients with chronic hemodialysis in both HCV positive and negative groups. Also, patients infected with HCV had a longer duration of dialysis ( $P = 0.001$ ).

Table 2. Determination of HCV infection in chronic hemodialysis patients according to age, Duration of hemodialysis, and the number of dialysis per week by Mann–Whitney test

|  | Number | Average rating | Amount | P-Value |
|--|--------|----------------|--------|---------|
| <b>Age</b>                             |        |                |        |         |
| HCV positive                           | 4      | 54.6           | 208.5  | 0.25    |
| HCV negative                           | 158    | 82.2           |        |         |
| Total                                  | 162    | -              |        |         |
| <b>Duration of hemodialysis</b>        |        |                |        |         |
| HCV positive                           | 4      | 155.4          | 20.5   | 0.001   |
| HCV negative                           | 158    | 79.6           |        |         |
| Total                                  | 162    | -              |        |         |
| <b>The number of dialysis per week</b> |        |                |        |         |
| HCV positive                           | 4      | 97.5           | 252.0  | 0.32    |
| HCV negative                           | 158    | 81.1           |        |         |
| Total                                  | 162    | -              |        |         |

In Table 3, results of Fisher's exact test and  $t$ -test showed that there was no significant relationship between HCV infection with gender, history of transfusion, and renal transplantation.

Table 3. Determination of HCV infection in chronic hemodialysis patients according to gender, history of blood transfusion and renal transplantation by Fisher's exact test

|   | Number | HCV Positive | P-Value |
|---|--------|--------------|---------|
| <b>Gender</b>                           |        |              |         |
| Male                                    | 73     | 3            | 0.34    |
| Female                                  | 85     | 1            |         |
| Total                                   | 162    | 4            |         |
| <b>History of blood transfusion</b>     |        |              |         |
| Yes                                     | 86     | 3            | 0.62    |
| No                                      | 76     | 1            |         |
| Total                                   | 162    | 4            |         |
| <b>History of renal transplantation</b> |        |              |         |
| Yes                                     | 3      | -            | 1.00    |
| No                                      | 159    | 4            |         |
| Total                                   | 162    | 4            |         |

## Discussion

The present study aimed to determine the prevalence of HCV infection and its risk factors among chronic hemodialysis patients, who were attended to Amol dialysis center. Our results showed HCV prevalence dropped from 13% to 2.4% compared with the previous survey which was done by Taziki and Espahbodi from 2001 to 2006 in Mazandaran province (23).

The most important cause of infection reduction in this center is the use of erythropoietin instead of blood transfusion, which has been confirmed by other studies that erythropoietin-therapy reduces the risk of developing a viral infection in anemia due to renal failure (24, 25). Besides, this decrease reflects the improvement in the level of health and quality of the facilities in this dialysis center and in increasing the awareness of the personnel in dealing with this infection.

Regarding the reduction in the prevalence of HCV in this dialysis center, compared with the studies conducted on this issue, the rate of infection in this center was very low (24, 26-28), but compared with the rate of infection among Iranian blood

donors reported by Alavian *et al.* in 2002, it is still slightly high. This suggests that HCV infection is a major health-care problem in dialysis centers across Iran (26).

In this study, there was no significant relationship between age, gender, number of dialysis per week, history of blood transfusion, and history of renal transplantation with HCV (Table 2,3), while in some other studies, renal transplantation with a 1.8–8% of HCV prevalence was considered as one of the risk factors for the infection in hemodialysis patients (29-32). Most recipients of the renal transplant have been infected before transplantation, while during dialysis (29).

Also, in some other studies, it is reported that blood transfusion is one of the most important risk factors for HCV in hemodialysis patients (6, 33-35).

Duration of dialysis was the only factor that was found in this study in relation to HCV infection ( $P = 0.001$ ). Our result was in the same line with the study conducted by Jasuja *et al.* (36) in 2009. Moreover, some review articles confirm that the duration of dialysis is correlated with HCV infection (37, 38).

Regarding the fact that the number of dialysis per week leads to patient survival, and actually increases the duration of dialysis over a lifetime (26), in this study, the number of dialysis per week did not correlate with HCV infection ( $P = 0.32$ ).

The remarkable point of this study was the design of a study that was not carried out at this period and there was no accurate data on the prevalence of HCV among hemodialysis patients in this dialysis center.

Regarding the limitations of this study, we can mention the small sample size and abnormal distribution of data that can be responsible for the non-significant relationship between variables.

#### **Conclusion:**

We found that the prevalence of HCV among hemodialysis patients in Amol dialysis center has been significantly reduced compared to previous years, as well as the duration of dialysis was identified as the most important risk factor for developing an infection in this center. Considering the findings of this study and other studies, several strategies such as screening for HCV detection with high sensitivity methods, early renal transplantation to prevent long-term dialysis, using erythropoietin instead of blood transfusion, updating the equipment of dialysis centers as well as training personnel at these centers can significantly reduce the risk of HCV infection in these patients. Due to the sample size that cannot be generalized to the entire community, it is recommended to perform a comprehensive nationwide study to find more risk factors affecting the issue for prevention of development of HCV in these patients.

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#### **References**

1. 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 international*. 2004;65(6):2335-42.
2. Oesterreicher C, Hammer J, Koch U, Pfeffel F, Sunder-Plassmann G, Petermann D, et al. HBV and HCV genome in peripheral blood mononuclear cells in patients undergoing chronic hemodialysis. *Kidney international*. 1995;48(6):1967-71.
3. Shamsirian A, Alikhani S, Alipoor R, Jafarpour H, Espahbodi F, Azizi S. Evaluation of Immunogenicity of Hepatitis B Vaccine in Hemodialysis Patients at Mazandaran Heart Center, Iran. *Biomedical and Pharmacology Journal*. 2017;10(2):557-62.
4. Lauer GM, Walker BD. Hepatitis C virus infection. *New England journal of medicine*. 2001;345(1):41-52.
5. Di Napoli A, Pezzotti P, Di Lallo D, Petrosillo N, Trivelloni C, Di Giulio S, et al. Epidemiology of hepatitis C virus among long-term dialysis patients: a 9-year study in an Italian region. *American Journal of Kidney Diseases*. 2006;48(4):629-37.
6. Hinrichsen H, Leimenstoll G, Stegen G, Schrader H, Fölsch U, Schmidt W. Prevalence and risk factors of hepatitis C virus infection in haemodialysis patients: a multicentre study in 2796 patients. *Gut*. 2002;51(3):429-33.
7. Di Lallo D, Miceli M, Petrosillo N, Perucci CA, Moscatelli M. Risk factors of hepatitis C virus infection in patients on hemodialysis: a multivariate analysis based on a dialysis register in Central Italy. *European journal of epidemiology*. 1999;15(1):11-4.
8. Handajani R, Lusida M, Darmadi S, Adi P, Ishido S, Katayama Y, et al. Differential prevalence of hepatitis C virus subtypes in healthy blood donors, patients on maintenance hemodialysis, and patients with hepatocellular carcinoma in Surabaya, Indonesia. *Journal of clinical microbiology*. 1996;34(12):2875-80.
9. Schneeberger PM, Keur I, van Loon AM, Mortier D, de Coul KO, Verschuuren-van Haperen A, et al. The prevalence and incidence of hepatitis C virus infections among dialysis patients in the Netherlands: a nationwide prospective study. *The Journal of infectious diseases*. 2000;182(5):1291-9.
10. Fabrizi F, Lunghi G, Guarnori I, Raffaele L, Di Filippo S, Erba G, et al. Virological characteristics of hepatitis C virus infection in chronic hemodialysis patients: a cross-sectional study. *Clinical nephrology*. 1995;44(1):49-55.
11. Hardy N, Sandroni S, Danielson S, Wilson W. Antibody to hepatitis C virus increases with time on hemodialysis. *Clinical nephrology*. 1992;38(1):44-8.

12. Huang C-S, Ho M-S, Yang C-S, Lee C, Tan C. Hepatitis C markers in hemodialysis patients. *Journal of clinical microbiology*. 1993;31(7):1764-9.
13. Covic A, Iancu L, Apetrei C, Scripcaru D, Volovat C, Mititiuc I, et al. Hepatitis virus infection in haemodialysis patients from Moldavia. *Nephrology, dialysis, transplantation: official publication of the European Dialysis and Transplant Association-European Renal Association*. 1999;14(1):40-5.
14. Fabrizi F, Raffaele L, Bacchini G, Guarnori I, Pontoriero G, Erba G, et al. Antibodies to hepatitis C virus (HCV) and transaminase concentration in chronic haemodialysis patients: a study with second-generation assays. *Nephrology Dialysis Transplantation*. 1993;8(8):744-7.
15. Irish DN, Blake C, Christophers J, Craske JE, Burnapp L, Abbs IC, et al. Identification of hepatitis C virus seroconversion resulting from nosocomial transmission on a haemodialysis unit: implications for infection control and laboratory screening. *Journal of medical virology*. 1999;59(2):135-40.
16. Bukh J, Wantzin P, Krogsgaard K, Knudsen F, Purcell RH, Miller RH, et al. High prevalence of hepatitis C virus (HCV) RNA in dialysis patients: failure of commercially available antibody tests to identify a significant number of patients with HCV infection. *Journal of Infectious Diseases*. 1993;168(6):1343-8.
17. Fernandez JL, del Pino N, Lef L, Valtuille R, Berridi J, Rendo P, et al. Serum hepatitis C virus RNA in anti-HCV negative hemodialysis patients. *Dialysis & transplantation*. 1996;25(1):14-8.
18. Kuhns M, De Medina M, McNamara A, Jeffers LJ, Reddy KR, Silva M, et al. Detection of hepatitis C virus RNA in hemodialysis patients. *Journal of the American Society of Nephrology*. 1994;4(7):1491-7.
19. Schröter M, Feucht H-H, Schäfer P, Zöllner B, Laufs R. High percentage of seronegative HCV infections in hemodialysis patients: the need for PCR. *Intervirolgy*. 1997;40(4):277-8.
20. Seelig R, Renz M, Bottner C, Seelig H. Hepatitis C virus infections in dialysis units: prevalence of HCV-RNA and antibodies to HCV. *Annals of medicine*. 1994;26(1):45-52.
21. De Medina M, Schiff ER, editors. *Hepatitis C: diagnostic assays*. Seminars in liver disease; 1995: © 1995 by Thieme Medical Publishers, Inc.
22. Gretch DR, dela Rosa C, Carithers Jr RL, Willson RA, Williams B, Corey L. Assessment of hepatitis C viremia using molecular amplification technologies: correlations and clinical implications. *Annals of internal medicine*. 1995;123(5):321-9.
23. Taziki O, Espahbodi F. Prevalence of hepatitis C virus infection in hemodialysis patients. *Saudi journal of kidney diseases and transplantation*. 2008;19(3):475.
24. Carneiro MA, Martins R, Teles SA, Silva SA, Lopes CL, Cardoso DD, et al. Hepatitis C prevalence and risk factors in hemodialysis patients in Central Brazil: a survey by polymerase chain reaction and serological methods. *Memórias do Instituto Oswaldo Cruz*. 2001;96(6):765-9.
25. Méndez-Sánchez N, Motola-Kuba D, Chavez-Tapia NC, Bahena J, Correa-Rotter R, Uribe M. Prevalence of hepatitis C virus infection among hemodialysis patients at a tertiary-care hospital in Mexico City, Mexico. *Journal of clinical microbiology*. 2004;42(9):4321-2.
26. 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(5):256-60.
27. Jadoul M, Cornu C, de Strihou CvY, Group UCS-LUC. Universal precautions prevent hepatitis C virus transmission: A 54 month follow-up of the Belgian multicenter study. *Kidney international*. 1998;53(4):1022-5.
28. Jadoul M, Poignet JL, Geddes C, Locatelli F, Medin C, Krajewska M, et al. The changing epidemiology of hepatitis C virus (HCV) infection in haemodialysis: European multicentre study. *Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association*. 2004;19(4):904-9.
29. Baid-Agrawal S, Pascual M, Moradpour D, Somasundaram R, Mucche M. Hepatitis C virus infection and kidney transplantation in 2014: what's new? *American journal of transplantation : official journal of the American Society of Transplantation and the American Society of Transplant Surgeons*. 2014;14(10):2206-20.
30. Kliem V, Burg M, Haller H, Suwelack B, Abendroth D, Fritsche L, et al. Relationship of hepatitis B or C virus prevalences, risk factors, and outcomes in renal transplant recipients: analysis of German data. *Transplantation proceedings*. 2008;40(4):909-14.
31. Santos L, Alves R, Macario F, Parada B, Campos M, Mota A. Impact of hepatitis B and C virus infections on kidney transplantation: a single center experience. *Transplantation proceedings*. 2009;41(3):880-2.
32. Scott DR, Wong JK, Spicer TS, Dent H, Mensah FK, McDonald S, et al. Adverse impact of hepatitis C virus infection on renal replacement therapy and renal transplant patients in Australia and New Zealand. *Transplantation*. 2010;90(11):1165-71.
33. Hassanshahi G, Arababadi MK, Assar S, Hakimi H, Karimabad MN, Abedinzadeh M, et al. Post-transfusion-transmitted hepatitis C virus infection: a study on thalassemia and hemodialysis patients in southeastern Iran. *Archives of virology*. 2011;156(7):1111-5.

34. Knudsen F, Wantzin P, Rasmussen K, Ladefoged SD, Lokkegaard N, Rasmussen LS, et al. Hepatitis C in dialysis patients: relationship to blood transfusions, dialysis and liver disease. *Kidney Int.* 1993;43(6):1353-6.
35. Knudsen F, Wantzin P, Rasmussen K, Ladefoged SD, Løkkegaard N, Rasmussen LS, et al. Hepatitis C in dialysis patients: Relationship to blood transfusions, dialysis and liver disease. *Kidney international.* 1993;43(6):1353-6.
36. Jasuja S, Gupta AK, Choudhry R, Kher V, Aggarwal DK, Mishra A, et al. Prevalence and associations of hepatitis C viremia in hemodialysis patients at a tertiary care hospital. *Indian Journal of Nephrology.* 2009;19(2):62-7.
37. Marinaki S, Boletis JN, Sakellariou S, Delladetsima IK. Hepatitis C in hemodialysis patients. *World Journal of Hepatology.* 2015;7(3):548-58.
38. Ozer Etik D, Ocal S, Boyacioglu AS. Hepatitis C infection in hemodialysis patients: A review. *World Journal of Hepatology.* 2015;7(6):885-95.

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