Iranian Journal of Virology 2010;4(2): 38-44
©2010, Iranian Society for Virology

Original Article

Prevalence of hepatitis C, hepatitis B, and HIV infection among hemodialysis patients in Jenin District (Palestine)

Abumwais JQ[1]*, Idris OF[2]

1. Faculty of allied medical science, Jenin University, Jenin, Palestine.
2. Faculty of Science and Technology, Alneelain University, Khartoum, Sudan.

Abstract

Background and Aims: End-stage renal disease patients treated by hemodialysis (HD) are more susceptible for infection by viral hepatitis and human immunodeficiency virus (HIV) infections. Infection by these viruses is promoted by the characteristic immunological dysfunction that develops in renal failure and interferes with the patient's ability to eliminate these viruses. Prevalence of these viruses among hemodialysis patients in Jenin District (Palestine) was not studied until now, we aimed in this study to determine the prevalence of HCV, HBV and HIV among hemodialysis patients in Jenin District using serological methods, and to define the main risk factors for HCV infection.

Materials and Methods: End-stage renal disease (ESRD) patients on maintenance hemodialysis from various demographic areas in Jenin District were included in the study. Data such as age, sex, drug abuse, history of transplantation were examined. Serological markers for HCV, HBV and HIV were determined using a microparticle enzyme immunoassay (MEIA). Pearson's correlation factor and independent samples t-test were used to analyze the significance of results.

Results: The patients were 77 (42 males, 35 females, mean age 50.73 ± 16.78 years [age range: 14 – 80 years]), the mean duration of dialysis was 26.97 months with a standard deviation of 35.19 days. The prevalence of HCV was 24.68 % while the prevalence of HBsAg and HIV were 0% respectively. HCV seropositivity was associated with longer period of dialysis (P=0.000). There was no statistically significant correlation between age and HCV seropositivity (P=0.630), also there was no statistically significant relationship between sex and infection with HCV (P=0.849).

Conclusion: The prevalence of HCV among hemodialysis patients in Jenin District is high compared to many Arab and other countries. None of the patients were a former drug abuser or had a history of tattooing. None of the patients was with a former transplant was HCV positive, so it seemed that the infection was mainly nosocomial during dialysis process. Duration of dialysis was an important risk factor (P=0.000). Dialysis staff, incomplete disinfection of dialysis machines (monitors), non-isolation of HCV positive patients on special dialysis units or special monitors may be important risk factors. So, careful attention of the preventive infection control measures is essential to limit the transmission of HCV in the dialysis unit in Jenin District.

Keywords: Hepatitis C; Prevalence; HIV Infections; Hepatitis B

***Corresponding author:** Jamal Qasem Abumwais, PhD, Professor of allied medical science, Palestinian Ministry of education and higher education, Jenin, Palestine.
Tel: (+97) 24 25 18 312
Email: jamal_abumwais@yahoo.com

Introduction

Hemodialysis (HD) patients suffer from many complications of the disease, among these are viral infections.

[Downloaded from journal.isv.org.ir on 2026-11-08]
[DOI: 10.21859/isv.4.2.38]

Hemodialysis patients are at high risk of viral hepatitis due to the high number of blood transfusion sessions, prolonged vascular access and the potential for exposure to infected patients and contaminated equipments (1). Patients on chronic hemodialysis have a high prevalence of hepatitis C (HCV) infection, which is now recognized as the principal cause of liver disease in kidney failure patients undergoing renal replacement therapy (2). HCV prevalence in hemodialysis patients varies considerably among different areas of the world (3). The prevalence of HCV infection among dialysis patients also varies among dialysis centers within a single country (4). The prevalence of HCV antibodies has been reported to range from 1.9 % to 80 % (1), on the other hand, HBV infection is less prevalent than HCV in hemodialysis units (5). The rate of serum hepatitis B surface antigen (HBsAg) seropositivity in patients on maintenance hemodialysis in the developed world is currently low (0-10%) but outbreaks of acute HBV infection continue to occur in this setting, on the other hand, the prevalence of HBV infection within dialysis units in developing countries appears higher (2-20%) based on relatively few reports (1). Compared with rate of infection with HCV or HBV, the risk of infection with HIV among hemodialysis patients is lower as the contact with contaminated sources is low (6).

No previous study has been reported concerning the prevalence of hepatitis viruses or HIV infection among hemodialysis patients in Jenin District (Palestine). So we aimed in this study to estimate the prevalence of HBV, HCV, and HIV among hemodialysis patients in Jenin District using serological techniques and to determine the main risk factors for HCV infection.

Methods

Area of study

This study included Jenin District which includes Jenin city and the surrounding villages with a population of about 280000.

Patients

The study concluded all end-stage renal disease patients from Jenin District treated by hemodialysis at The Martyr Dr Khalil Sulaiman Hospital in Jenin city. There was no peritoneal dialysis treatment in Jenin District. All patients responded to a questionnaire which contains information about there identity including age, sex, place of birth, place of setting, occupation; and clinical information like history of transplantation, drug abuse, history of tattooing. Information about duration of dialysis was taken from the files of the patients.

From the total of 77 patients, 42 (54.5%) of them were males and 35 (45.5%) were females. The age ranged from 14-80 years with a mean age of 50.73 year.

Study period

The study has been conducted in during one year from August 2005 to August 2006.

Setting of the study

The study has been conducted at the laboratory and the kidney unit of The Martyr Dr. Khalil Sulaiman Hospital in Jenin city which is the only hemodialysis unit in Jenin district where all patients from Jenin district are treated.

Serological tests

For anti-HCV antibodies determination, IMx HCV version 3.0 kit (Abbott IMx System, Abbott Laboratories, and Abbott Park, Illinois, USA) was used. This is a microparticle enzyme immunoassay (MEIA) for the detection of antibodies to hepatitis C virus (anti –HCV) in human serum or plasma.

For HBsAg determination, IMx HBsAg version 2.0 kit (Abbott IMx System) was used. This is a qualitative third generation microparticle enzyme immunoassay for the detection of hepatitis B surface antigen (HBsAg) in human serum or plasma.

For HIV determination, IMx HIV-1/HIV-2 III Plus kit (Abbott IMx System, Abbott Laboratories, Abbott Park, Illinois, USA) was used. This is a microparticle enzyme immunoassay (MEIA) for the qualitative detection of antibodies to human immunodeficiency viruses type 1 and/or type 2 (HIV-1/HIV-2) in human serum or plasma.

Statistical analysis

[Downloaded from journal.isv.org.ir on 2026-11-08]

[DOI: 10.21859/isv.4.2.38]

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 10 (SPSS Inc., Chicago, IL, USA). Pearson's correlation factor was used to test if there is a relation between duration of dialysis or age and infection with hepatitis C virus (HCV). Independent samples T-test was used to test if there was differences in infection with HCV between patients on hemodialysis for ≥ 3 years and those on hemodialysis for < 3 years. T-test was also used to test if there was a relationship between sex and HCV seropositivity. All tests were two sided, *P* values < 0.05 were considered as significant.

Results

Table 1. Age intervals of hemodialysis patients in Jenin District (Palestine)

Age interval (years)	Number of patients
0 - 15	3
16 - 30	9
31- 45	13
46 - 60	31
>61	21

The mean duration of dialysis was 26.97 months with a standard deviation of 35.19 months, the minimum dialysis period was 1/2 month and the maximum dialysis period was 180 months.

The study showed that 68.8 % of patients were between age 16 and 60 years old, the age intervals of patients are shown in table (1).

In this study, 19 patients (24.68 %) were anti-HCV positive [10 were males (52.6 %) and 9 were females (47.4%)], on the other hand, there was no patient positive for HBsAg or HIV.

Considering the patients infected by HCV, there was not any patient with former drug abuse or had a history of tattooing. None of the patients with a history of transplantation were positive for anti-HCV during the study period.

The study showed that there was a strong significant correlation between duration of dialysis and infection with HCV (Pearson's correlation coefficient= 0.584; P-value= 0.000).The mean duration for HCV positive patients was 62.63 months while for HCV negative patients, it was 14.76.

The study showed that the prevalence of anti-HCV among patients with dialysis interval (< 3 years) was 7.55 % (4 patients out of 53); on the other hand, the prevalence of anti-HCV among patients with dialysis interval (≥ 3 years) was 62.5 % (15 patients out of 24). HCV infection seems to be significantly higher in patients on hemodialysis for ≥ 3 years compared to patients on hemodialysis for < 3 years (P-value=0.000).

The results showed that there was no significant correlation between age and infection with HCV (Pearson's correlation coefficient = -0.056; P = 0.630).

The results also showed that there was no statistically significant relationship between sex and infection with HCV (P- value = 0.849)

Discussion

The prevalence of HCV among dialysis patients in Jenin District is higher than that found in Nigeria (6), USA (7, 8), Japan (9), Iran (10- 12), Kenya (13), Turkey (14), Belgium (15, 16), Italy (16), Hungary (16), Spain(16),United Kingdom(16), Slovenia (17), France (18), Germany (16,19), Netherlands (20), Sweden (16, 21), Brazil (22, 23), Mexico (2, 24) , Puerto Rico (25), Switzerland (26), on the other hand, it is lower than that found in Poland (16),Taiwan (27), Moldavia (28), Senegal (29), Bosnia and Herzegovina (30), Greece (31), Peru (32), Kosovo (33), Philippines (34).

In comparison to the Arab world, the prevalence of HCV among hemodialysis patients in Jenin District is higher than that in Libya (35), Sudan (36), Saudi Arabia (37), Bahrain (37), Tunisia (38) and lower than that in Morocco (39), Lebanon (40), Jordan (41), Syria (42, 43) , Egypt (44), Iraq (3). The differences in the prevalence of HCV between Jenin District and many Arab countries may be as a result of many factors, the variation in the degree of implementation of the universal precautions to prevent nosocomial transmission may be an important factor.

[Downloaded from journal.isv.org.ir on 2026-11-08]

[DOI: 10.21859/isv.4.2.38]

The prevalence of HBsAg among hemodialysis patients in Jenin District (0 %) is less than that found in Nigeria (6),USA (7), Iran (10), Turkey (14), Switzerland (26), Taiwan (27), Moldavia (28), Senegal (29), Kosovo (33), Philippines (34), Saudi Arabia (37), Bahrain(37), Morocco (39), Croatia (45), Jordan (46), Hong Kong (47), India (48), Brazil (49).

The prevalence of HIV among hemodialysis patients in Jenin District (0 %) is similar to that in Kosovo (33), Morocco (39) but less than that in Nigeria (6), USA (7), France (50), Spain (51).

The results showed that there was no significant correlation between age of patients and infection with HCV, this is in line with what was found in Syria (43) and Egypt (44), on the other hand, our results differ from what was found in Iraq (3), USA (8), and Sudan (36) where they found that HCV seropositivity was associated with age.

The results showed that there was no statistically significant relationship between sex of patients and infection with HCV, this is in line with what was found in Syria (43), Egypt (44) but this is not in line with that found in Iraq (3) and USA (8) where they found that HCV seropositivity was associated with female gender and male gender respectively.

The present study showed that duration of dialysis is an important risk factor for infection by HCV among hemodialysis patients in Jenin District, this is in line with what was found in Iraq (3), USA (8), Iran (10-11) , Kenya (13), France (18), Germany (19), Brazil (23), Mexico (24), Taiwan (27), Moldavia (28), Senegal (29), Bosnia and Herzegovina (30), Kosovo (33), Philippines (34), Sudan (36), Morocco (39), Lebanon (40), Jordan (41), Syria (43), Egypt (44). The results also showed that HCV infection is significantly higher in patients on hemodialysis for $\geq$ 3 years compared to patients on hemodialysis for < 3 years, this is in line with a previous study in Syria (43).

It is obvious from the results that duration of dialysis is a very important risk factor for HCV infection. The effect of duration of dialysis on HCV infection may be mainly due to nosocomial transmission of HCV in the dialysis unit as indicated by other studies which have shown the role of HD environment (especially infected patients) for dissemination of HCV among patients (52-53). The number of staff per patients has an important role in the dissemination of HCV infection. A previous study showed that the combination of understaffing and a high level of infected patients in the dialysis unit increase the risk for HCV nosocomial transmission (54). From our observations in this study, it was not unusual to find the dialyzing staff taking care of susceptible and infected patients in the same shift. In addition, the dialyzing staff- in many times – did not change the gloves during transferring from patient to patient even during transferring from HCV positive to HCV negative patients, without taking care that this practice may facilitate the dissemination of HCV infection from one patient to another.

In our opinion it seems that the main source of infection by hepatitis c virus (HCV) is nosocomial during the dialysis process as a result of contact with contaminated equipments and persons. This transmission of HCV to dialysis patients in Jenin district might be as a result of contact among patients, between patients and dialysis machines or equipments, and between patients and dialysis staff especially that there was no isolation of HCV positive patients on special dialysis units or machines.

Conclusion

The prevalence of HBsAg and HIV among hemodialysis patients in Jenin District was 0% respectively on the other hand, the prevalence of HCV was 24.68%. The prevalence of HCV among hemodialysis patients in Jenin District is considered high compared to many developed and developing countries around the world including many Arab countries. This is mainly due to nosocomial transmission in the dialysis unit. Universal infection control precautions are very important for prevention of nosocomial HCV transmission in our hemodialysis unit. These may include isolation

[Downloaded from journal.isv.org.ir on 2026-11-08]

[DOI: 10.21859/isv.4.2.38]

of HCV positive patients in a special unit or at least special section in the dialysis unit with a special dialysis staff; disinfecting all dialysis unit surfaces especially monitors hardly after each patient treatment; disinfecting hands and changing gloves and gowns between patient contacts; preparing medications outside the dialysis unit; using of items, medications, or instruments that are dedicated for use only for one patient. Dialysis staff must also review their practices and increase their vigilance in order to decrease HCV transmission. Palestinian Ministry of Health should be aware about the prevalence of HCV infection among hemodialysis patients generally and in Jenin District in particular in order to make necessary changes in the infection control measures. Implementations of surveillance systems and educational programs for the hemodialysis unit's personnel about recommended infection control measures in the hemodialysis units are necessary. Implementation of a hard and effective infection control measures may cause a decrease in the incidence and prevalence of HCV infection among hemodialysis patients in Jenin district.

Acknowledgement

We are greatly indebted to Palestinian Ministry of Health and to Dr. Mohammad Abu-Ghali, the head master of The Martyr Dr. Khalil Sulaiman Hospital who gave us the chance and all facilities to do this study in the laboratory and the kidney unit. We also thank Mr. Monged Daraghma, the head master of the laboratory department and to all the technical staff for their assistance. Special thanks to all the patients of the kidney unit who participated in the study. We also express our great appreciation to the nursing staff in the dialysis unit specially Khalid Sobh for their cooperation and encouragement.

References

1.Telaku S, Fejza H, Elezi Y, Bicaj T. Hepatitis B and C in dialysis units in Kosova. Virology Journal. 2009;6:72-8.

2. 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. J Clin Microbiol. 2004;42(9):4321-2.

3. Khattab OS. Prevalence and risk factors for hepatitis C virus infection in hemodialysis patients in an Iraqi transplant center. Saudi J Kidney Dis Transpl. 2008;19(1):110-5.

4. Alavian SM. Hepatitis C in hemodialysis patients' needs more attention for control and review the risk factors. Saudi J Kidney Dis Transpl. 2010;21(2):357-8.

5. 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 Int. 1995;48:1967-71.

6. Onyekwere CA, Awobusuyi Z, Ogbera AO. Pattern of hepatitis and HIV infection among dialysis patients in Urban Hospitals in Lagos Nigeria; implication for control. Nigerian Medical Practitioner. 2007;51(5):100-102.

7. Tokars JI, Finelli L, Alter MJ, Arduino MJ. National surveillance of dialysis-associated diseases in the United States 2001**.** Semin Dial 2004;17(4)**:**310-9.

8.Kalantar-Zadeh K, Kilpatrick RD, McAllister CJ, Miller LG, Daar ES, Gjertson DW, et al. Hepatitis C virus and death risk in hemodialysis patients**.** J Am Soc Nephrol. 2007;18(5):1584-93.

9. Oguchi H, Miyasaka M, Tokunaga S**.** Hepatitis virus infection (HBV and HCV) in eleven Japanese hemodialysis units. Clin Nephrol. 1992;38(1):36-43.

10. Taremi M, Khoshbaten M, Gachkar L, Ehsani Ardakani M, Zali M. Hepatitis E virus infection in hemodialysis patients: A seroepidemiological survey in Iran. BMC Infect Dis. 2005;5(1)**:**36-8.

11. 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(5):256-60.

12. Rais-Jalali G, Khajehdehi P. Anti-HCV seropositivity among haemodialysis patients of Iranian origin. Nephrol Dial Transplant. 1999;14(8):2055-6.

13. Otedo AE, Mc'Ligeyo SO, Okoth FA. Seroprevalence of hepatitis B and C in maintenance dialysis in a public hospital in a developing country. S Afr Med J. 2003;93(5):380-4.

14. Yakaryilmaz F, Gurbuz OA, Guliter S. Prevalence of occult hepatitis B and hepatitis C

[Downloaded from journal.isv.org.ir on 2026-11-08]

[DOI: 10.21859/isv.4.2.38]

virus infections in Turkish hemodialysis patients. Ren Fail. 2006;28(8):729-35.
15. Jadoul M, Cornu C, Persele de Y, Strihou C. Universal precautions prevent hepatitis C virus transmission: a 54 month follow-up of the Belgian Multicenter Study. The Universitaires Cliniques St-Luc (UCL) Collaborative Group. Kidney Int. 1998;53:1022-5.
16. 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. Nephrol Dial Transplant. 2004;19:904-9.
17. Buturović-Ponikvar J. Renal replacement therapy in Slovenia: annual report 2001. Nephrol Dial Transplant. 2003;18(5):53-5.
18. Salama G, Rostaing L, Sandres K, Izopet J. Hepatitis C virus infection in French hemodialysis units: a multicenter study. J Med Virol. 2000;61:44-51.
19. Hinrichsen H, Leimenstoll G, Stegen G, Schrader H, Fölsch UR, Schmidt WE. Prevalence and risk factors of hepatitis C virus infection in haemodialysis patients: a multicentre study in 2796 patients. Gut. 2002;51:429-33.
20. Schneeberger PM, Keur I, Loon AM, Mortier D, Coul KO, Haperen AV, et al. The prevalence and incidence of hepatitis C virus infections among dialysis patients in the Netherlands: a nationwide prospective study. J Infect Dis. 2000;182:1291-9.
21. Almroth G, Ekermo B, Månsson AS, Svensson G, Widell A. Detection and prevention of hepatitis C in dialysis patients and renal transplant recipients. A long-term follow up (1989–January 1997). J Intern Med. 2002;251:119-28.
22. Lopes EP, Gouveia EC, Albuquerque AC, Sette LH, Mello LA, Moreira RC, et al. Determination of the cut-off value of serum alanine aminotransferase in patients undergoing hemodialysis, to identify biochemical activity in patients with hepatitis C viremia. J Clin Virol. 2006;35:298-302.
23. Freitas SZ, Cunha RV, Martins RM, Teles SA, Ibanhes ML, Motta-Castro AR. Prevalence, genotypes and risk factors associated with hepatitis C virus infection in hemodialysis patients in Campo Grande, MS, Brazil. Mem Inst Oswaldo Cruz. 2008;103(4):405-8.
24. Gonzalez-Michaca L, Mercado A, Gamba G. Hepatitis C viral in patients with terminal chronic kidney failure.I. Prevalence. Rev Invest Clin. 2000; 52(3):246-54.
25. López-Navedo PJ, Lebrón-Rivera R, González-Trápaga J, Weber-Acevedo J, Lefevre-Ramos E, Flores-de Hostos E, et al. Prevalence of hepatitis C virus infection at three hemodialysis units in the western region of Puerto Rico. Bol Asoc Med P R 1999;91:100-2.
26. Ambuhl PM, Binswanger U, Renner EL. Epidemiology of chronic hepatitis B and C among dialysis patients in Switzerland. Schweiz Med Wochenschr. 2000;130(10):341-8.
27. Chen KS, Lo SK, Lee N, Leu ML, Huang CC, Fang KM. Superinfection with hepatitis C virus in hemodialysis patients with hepatitis B surface antigenemia: Its prevalence and clinical significance in Taiwan. Nephron. 1996;73(2):158-164.
28. 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(1):40-45.
29. Diouf ML, Diouf B, Niang A, Ka EH, Pouye A, Seck A, et al. Prevalence of hepatitis B and C viruses in a chronic hemodialysis center in Dakar. Dakar Med. 2000;45:1-4.
30. Ahmetagić S, Muminhodzić K, Cickusić E, Stojić V, Petrović J, Tihić N. Hepatitis C infection in risk groups. Bosn J Basic Med Sci. 2006;6:13-7.
31. Rigopoulou EI, Stefanidis I, Liaskos C, Zervou EK, Rizos C, Mina P, et al. HCV-RNA qualitative assay based on transcription mediated amplification improves the detection of hepatitis C virus infection in patients on hemodialysis: results from five hemodialysis units in central Greece. J Clin Virol. 2005;34:81-5.
32. Sanchez JL, Sjogren MH, Callahan JD, Watts DM, Lucas C, Abdel-Hamid M, et al. Hepatitis C in Peru: risk factors for infection, potential iatrogenic transmission, and genotype distribution. Am J Trop Med Hyg. 2000;63:242-8.
33. Quaglio GL, Pattaro C, Ramadani N, Bertinato L, Elezi Y, Dentico P, et al. Viral hepatitis, HIV, human herpes virus and Treponema pallidum infection in haemodialysis patients in Kosovo, 2005. Euro Surveill. 2009;14(49):194-9.
34. Santos M, Danguilan R, Que E, Balmaceda R, Padilla B. Prevalence of hepatitis B and hepatitis C in haemodialysis patients. Nephrology. 1998;4(1):101-4.
35. Daw MA, Elkaber MA, Drah AM, Werfalli MM, Mihat AA, Siala IM. Prevalence of hepatitis C virus antibodies among different populations of relative and attributable risk. Saudi Med J. 2002;23:1356-60.
36. El-Amin HH, Osman EM, Mekki MO, Abderlraheem MB, Ismail MO, Yousif ME, et al. Hepatitis C virus infection in hemodialysis patients in Sudan: Two centers report. Saudi J Kidney Dis Transpl. 2007;18(1):101-106.

[Downloaded from journal.isv.org.ir on 2026-11-08]

[DOI: 10.21859/isv.4.2.38]

37. Almawi WY, Qadi AA, Tamim H, Ameen G, Bu-Ali A, Arrayid S, et al. Seroprevalence of hepatitis C virus and hepatitis B virus among dialysis patients in Bahrain and Saudi Arabia. Transplant Proc. 2004; 36(6):1824–1826.
38. Hmaied F, Ben Mamou M, Saune-Sandres K, Rostaing L, Slim A, Arrouji Z, et al. Hepatitis C infection among dialysis patients in Tunisia: Incidence and molecular evidence for nosocomial transmission. J Med Virol. 2006;78(2):185-91.
39. Boulaajaj K, Elomari Y, Elmaliki B. Prevalence of hepatitis C, hepatitis B and HIV infection among haemodialysis patients in Ibn-Rochd university hospital, Casablanca. Nephrol Ther. 2005;1(5):274-84.
40. Naman RE, Mansour I, Klayme S, Khalil G. Hepatitis C virus in hemodialysis patients and blood donors in Lebanon. J Med Liban 1996;44(1):4–9.
41. Bdour S. Hepatitis C virus infection in Jordanian haemodialysis units: serological diagnosis and genotyping. J Med Microbiol. 2002;51(8):700–4.
42. 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(4):571–6.
43. Othman B, Monem F. Prevalence of antibodies to hepatitis C virus among hemodialysis patients in Damascus, Syria. Infection. 2001;29(5):262-5.
44. Hassan AA, Khalil R. Hepatitis C in dialysis patients in Egypt: relationship to dialysis duration, blood transfusion, and liver disease. Saudi J Kidney Dis Transpl. 2000;11:72-3.
45. Kes P, Slavicek J, Jankovic N. Prevention and treatment of hepatitis B in patients on hemodialysis and vaccination of hemodialysis health personnel against hepatitis B. Acta Med Croatica. 2005;59(5):479-82.
46. Munter H, Yousef A. Hepatitis B infection among Patients Receiving Chronic Hemodialysis at Royal Medical Services in Jordan. Saudi J Kidney Dis Transpl. 2008;19(2):260-7.
47. Leung CB, Ho YW, Chau KF, Choy BY, Tsang WK, Lui SF. Renal replacement therapy for chronic hepatitis B carrier: A subgroup analysis from the Hong Kong Renal Registry 1995–1999. Hong Kong J Nephrol. 2000;2:104-9.
48. Reddy GA, Dakshinamurthy KV, Neelaprasad P, Gangadhar T, Lakshmi V. Prevalence of HBV and HCV dual infection in patients on hemodialysis. Indian J Med Microbiol. 2005;23(1):41- 3.
49. Ferreira RC, Teles SA, Dias MA. Hepatitis B virus infection profile in hemodialysis patients in Central Brazil: Prevalence, risk factors and genotypes. Mem Inst Oswaldo Cruz. 2006;101(6):689-692.
50. Vigneau C, Guiard-Schmid JB, Tourret J, Flahault A, Rozenbaum W, Pialoux G, et al. The clinical characteristics of HIV-infected patients receiving dialysis in France between 1997 and 2002. Kidney Int. 2005;67:1509-14.
51. Carro CB. HIV and dialysis: unfounded optimism or real change. Nefrologia. 2008;28(5):479-82.
52. Allander T, Gruber A, Naghavi M, Beyene A, Söderström T, Björkholm M, et al. Frequent patient to patient transmission of hepatitis C virus in a haematology ward. Lancet. 1995;345(8950):603–7.
53. Sartor C, Brunet P, Simon S, Tamalet C, Berland Y, Drancourt M. Transmission of hepatitis C virus between hemodialysis patients sharing the same machine. Infect Control Hosp Epidemiol. 2004;25(7):609–11.
54. Petrosillo N, Gilli P, Serraino D, Dentico P, Mele A, Ragni P, et al. Prevalence of infected patients and understaffing have a role in hepatitis C virus transmission in dialysis. Am J Kidney Dis. 2001;37(5):1004-10.

[Downloaded from journal.isv.org.ir on 2026-11-08]

[DOI: 10.21859/isv.4.2.38]