



Investigation of Seroprevalence of Hepatitis B, Hepatitis C and HIV in Hemodialysis Patients

Hemodiyaliz Hastalarında Hepatit B, Hepatit C ve HIV Seroprevalansının Araştırılması

Ahmed Moustapha Nsangou¹, Rugıyya Samadzade¹, Salih Maçın¹,
 Gülperi Çelik², Duygu Fındık¹

¹Selçuk University, Faculty of Medicine, Department of Medical Microbiology, Konya, Turkey

²Selçuk University, Faculty of Medicine, Department of Internal Diseases, Konya, Turkey

Abstract

Aim: Impairments in the immune system of patients undergoing hemodialysis cause them to be more sensitive to infectious agents. The purpose of this study was to determine the seroprevalence of HBV, HCV and HIV in patients undergoing hemodialysis treatment.

Material and Method: HBsAg, Anti-HBs, Anti-HBc IgM, Anti-HBc IgG, HBV-DNA, Anti-HCV, HCV-RNA and Anti-HIV parameters were analyzed from serum samples of patients with chronic kidney disease (CKD) undergoing hemodialysis treatment in Selçuk University Faculty of Medicine Hospital in Turkey between 2010 – 2020 retrospectively.

Results: From a total of 4155 hemodialysis patients, HBsAg was determined only in 17 (0.40%) while Anti-HBs was positive in 454 (11.2%). Anti-HCV was detected as positive in 14 (0.33%) serums. HBV-DNA was found to be positive in 13 (76.5%) of HBsAg positive patients. HCV RNA was found to be positive in 12 (85.7%) of anti-HCV positive patients. Anti-HIV antibodies were not detected in any of the serum samples.

Conclusions: Proper infection control measures in hemodialysis patients can reduce the contamination of infectious agents. In addition, considering the immunosuppressive status of hemodialysis patients, the vaccination planning for Hepatitis B should be made appropriately.

Keywords: Hemodialysis, chronic kidney patients, hepatitis B, hepatitis C, HIV

Öz

Amaç: Hemodiyaliz (HD) uygulanan hastaların bağışıklık sistemindeki bozulmalar, hastaların enfeksiyon ajanlarına daha duyarlı olmasına neden olmaktadır. Bu çalışmanın amacı; hemodiyaliz tedavisi gören hastalarda HBV, HCV ve HIV seroprevalansını ortaya koymaktır.

Gereç ve Yöntem: Selçuk Üniversitesi Tıp Fakültesi Hastanesi'nde hemodiyaliz tedavisi gören kronik böbrek hastalarının (KBH) serum örneklerinden çalışılmış HBsAg, Anti-HBs, Anti-HBc IgM, Anti-HBc IgG, HBV-DNA, Anti-HCV, HCV-RNA ve Anti-HIV parametreleri 2010-2020 yılları arası retrospektif olarak taranmıştır.

Bulgular: 4155 hemodiyaliz hastasının 17'sinde (% 0,40) HBsAg ve 454'ünde ise (% 11,2) Anti-HBs pozitif bulunmuştur. Anti-HCV 14 (% 0.33) hastanın serumunda pozitif olarak saptanmıştır. HBsAg pozitif HD hastalarının 13'ünde (% 76,5) HBV-DNA pozitif saptanmıştır. Anti-HCV pozitif hastaların 12'sinde (% 85,7) HCV RNA pozitif olarak belirlenmiştir. Serum örneklerinin hiçbirinde anti-HIV antikorları tespit edilmemiştir.

Sonuç: Hemodiyaliz hastalarında uygun enfeksiyon kontrol önlemlerinin bulaşıcı ajanların kontaminasyonunu azaltabileceğini göstermiştir. Ayrıca, hemodiyaliz hastalarının immünosupresif durumu dikkate alınarak Hepatit B'ye karşı aşılama planlaması yapılmalıdır.

Anahtar Kelimeler: Hemodiyaliz, kronik böbrek hastalığı, hepatit B, hepatit C, HIV



INTRODUCTION

Chronic kidney disease (CKD) is a common health problem all over the world. It is a disease with progressive and irreversible loss of kidney's metabolic and endocrine functions as a result of a decrease in fluid electrolyte balance and a decrease in glomerular filtration. Due to the increasing frequency of CKD in the world, high morbidity and mortality rates are observed.^[1]

Chronic kidney disease is a serious public health problem due to its effects on the quality of life and the high cost of renal replacement therapies required for treatment.^[2] Many etiological factors are associated with the development of CKD with diabetic nephropathy and hypertension among the top first. Other etiological causes of the CKD include primary glomerular diseases, tubulointerstitial diseases, renal vascular diseases, chronic urinary tract obstruction, collagen tissue diseases and some metabolic diseases.^[3]

An effective hemodialysis (HD) has been found to reduce morbidity and mortality in patients with CKD. However, an effective HD depends on dialysis dose, nutritional status of patients, presence of comorbidity, degree of anemia, socio-economic status, compliance, adequate blood flow and membrane type used for hemodialysis.^[4]

HD patients are more susceptible to infections than healthy people due to chronic kidney insufficiency. As hemodialysis patients are immunosuppressive, their susceptibility to infections is increased.^[5] In particular, these patients are at high risk for infections through the blood. In addition to bacterial infections in these patients, blood-borne hepatitis B virus (HBV), hepatitis C virus (HCV) and Human Immunodeficiency Virus (HIV) may cause high mortality and morbidity.^[6] Percutaneous interventions, blood transfusions, hemodialysis machines and infected devices are among the factors that increase the possibility of getting hepatitis infections in each dialysis session. Infection control measures are applied in hemodialysis units to prevent transmission of viral infections.

The vast majority of infection related deaths are caused by vaccine-preventable infections. World Health Organization (WHO) and Turkish Nephrology Association (TND) recommend vaccination of patients with chronic kidney insufficiency against HBV. However, despite all precautionary measures taken during HD sessions, it has however been reported that HBV and HCV infections may still occur.^[7] The purpose of this study was to determine the seroprevalence of HBV, HCV and HIV in patients undergoing hemodialysis treatment.

MATERIAL AND METHOD

HBsAg (Hepatitis B surface antigen), Anti-HBs (Hepatitis B surface antibody), Anti-HBc IgM (Hepatitis B core IgM antibody), Anti-HBc IgG (Hepatitis B core IgG antibody), HBV-DNA, Anti-HCV, (Hepatitis C antibody), HCV-RNA and Anti-HIV (Human Immunodeficiency Virus Antibody) parameters were retrospectively screened between 1 July 2010 and 1 July 2020 in Selçuk University Faculty of Medicine. "HIV-1/2Ag/Ab

Combo" test was performed by the Architect i1000 sr (Abbott Diagnostics, Germany) device. Patients with confirmed positive serum samples were followed up in our laboratory by HIV -RNA testing (HI Virus-1 RT-PCR, Rotor Gene, QIAGEN, Germany). Architect i1000 sr (Abbott Diagnostics, Germany) device working with the chemiluminescence method was used to detect HBV and HCV. HBV-DNA and HCV-RNA parameters were studied by Real-Time PCR method using Cobas x480 (Roche, Sweden) device. Microsoft Excel software allowed us to compare these results.

The study protocol followed ethical guidelines of the Declaration of Helsinki. The Ethics Committee of Selçuk University Faculty of Medicine (Turkey) approved the ethical standards of our research (02/09/2020 – 2020/348).

RESULTS

Serum samples from 4155 hemodialysis patients were scanned retrospectively. 2405 (58%) of the patients were male and 1750 (42%) were female. HBsAg was positive in 17 (0.40%) patients. Anti-HBs positivity was found in 454 (11.2%) patients. Anti-HBs antibody level was found above 100 mIU/ml in 112 patients (24.7%). Anti-HBc IgG was positive in 10 (0.24%) patients and Anti-HBc IgM in 7 (0.16%) patients. HBV-DNA positivity was found in 13 (76.5%) of the HD patients who were HBsAg positive. Anti-HCV was positive in 14 (0.33%) of the patients (**Table 1**). HCV RNA was found to be positive in 12 (85.7%) of anti-HCV positive patients. Anti-HIV was negative in all samples.

Table 1. Seroprevalence distribution of hepatitis markers in hemodialysis patients

Hepatitis Markers	Seroprevalence (%)
HBsAg	0.40
Anti-HBs	11.2
Anti-HCV	0.33
Anti-HBc IgG	0.24
Anti-HBc IgM	0.16

HBs Ag: Hepatitis B surface antigen; Anti-HBs: Hepatitis B surface Antibody; Anti-HCV: Hepatitis C antibody; Anti-HBc IgG: Hepatitis B core IgG antibody; Anti-HBc IgM: Hepatitis B core IgM antibody

DISCUSSION

Despite the precautionary measures put in place, viral hepatitis remains an important risk factor for both patients and health workers in hemodialysis units. HBV seroprevalence in Turkey varies from region to region. However, the country is located in the middle endemicity zone in terms of HBV infection. In Turkey, reported seroprevalence of HBsAg in chronic hemodialysis patients varied from 3.6% to 8.7%.^[8-12]

In a cross-sectional study conducted on 360 HD patients in 5 hemodialysis centers in Tehran (Iran) HBsAg was found to be positive in five (1.39%) patients.^[13] HBsAg seroconversion rates were found to be 1.1% in Cameroon.^[14] HBsAg positivity was reported to be 7% in 113 HD patients in Vietnam and the

study warned hemodialysis services where universal measures are not taken.^[15]

In our study, HBsAg was found to be positive in 17 (0.40%) of hemodialysis patients. This seroprevalence was far below those of TND reported in 2016 (3.8%) and 2019 (2.57%).^[16] The reason for the low HBsAg seropositivity in hemodialysis patients in our study can be explained by timely implementation of prophylaxis programs associated with erythropoietin therapy, better blood control, separation of dialysis machines for HBsAg patients and good infection control measures.

Because of uremia-related immunosuppression, only 50-60% of HD patients develop an immune response to the vaccine. In addition, the generally developing response in these patients is low antibody titers and is short-term. Although the response to 3 doses of vaccine is 90-95% in people with normal immune system, it was stated that the vaccine response in HD patients is on average 64%.^[17]

In our study, Anti-HBs positivity was found in 454 (11.2%) patients and Anti-HBs antibody level was found above 100 mIU/ml in 112 patients (24.7%). Seropositivity of Anti-HBs in HD patients in similar studies carried out in Turkey was reported to range between 33.5-64%^[18] while Anti-HBs positivity was reported to be as high in HD patients as 72.2%.^[11]

As a whole, serological indicators of hemodialysis patients should be checked and patients with negative serological indicators should be immediately taken into the vaccination program for eventual vaccination. After vaccination, patients should be followed up and researched for Anti-HBs. Anti-HBs titers should be closely monitored and necessary precautions taken to ensure effective prophylaxis in patients. When all serological tests for HBV in HD patients are negative, those with isolated Anti-HBc positivity should be evaluated for occult hepatitis B and HBV DNA testing should be performed.

In Turkey, population-based studies with respect to the epidemiology of HBV and HCV revealed HBsAg positivity in 4%, anti-HCV positivity in 1%, and anti-HDV positivity in 2.8% of HBsAg-positive individuals.^[19]

According to current data, it is estimated that more than 170 million people worldwide are infected with HCV. In addition, one million people die each year from cirrhosis or liver cancer due to HCV infection.^[20] Liver Studies Association of Turkey reported Anti-HCV positivity as 0.95%. Anti-HCV seropositivity among HD patients has been reported to decrease in some countries over time while increasing in others.^[6,21]

HCV infection has a special importance in dialysis patients due to the high risk of transmission in hospitals and studies showed that HCV.^[19,20] In a meta-analysis, it has been reported that HCV carriage increases the risk of death in hemodialysis patients. In studies conducted in different countries, anti-HCV positivity rate was determined to vary between 4-59% depending of the geographical regions.^[16,21] Five percent (5.2%) of seropositivity for anti-HCV antibodies in chronic hemodialysis patients was reported in Turkey in 2019.^[8]

Our study showed anti-HCV positivity in 14 of 4155 hemodialysis patients (0.33%). Low percentage found in our study could be associated to sound implementation of necessary infection control measures in Konya province as well as appropriate training provided to healthcare professionals and patients. However, an effective vaccine has not been developed against HCV to date. For this reason, prevention of transmission and spread of HCV should be of prime importance. In addition, HCV RNA should be investigated in patients who are anti-HCV positive.

HIV-infected people show a broad spectrum from an asymptomatic carrier to a multisystemic disease. The incidence of kidney disease has been reported between 2-10% in HIV-infected patients. Some of these patients have end-stage renal failure or acute renal failure and are under dialysis treatment. HIV infection can also be transmitted to patients with CKD by blood transfusion, renal transplantation, needle stinging, or sexual contact.^[22] However, no HIV-positive serum was detected in our study because of strict application of disinfection rules, screening carried out on time and low HIV seroprevalence in Konya. Similar results have been reported in some studies carried out in other countries.^[18,23,24] However, HIV-related nephropathy (HIVAN), diabetes, and obstructive nephropathy was reported in Cameroon. The only case of HIV/HCV coinfection. Anti-HIV seropositivity detected in CKD patients was associated with age and history of STI (Sexually Transmissible Infections).^[25]

Studies have shown that it is sufficient to apply general disinfection rules in patients with HIV infection in dialysis units. In severe AIDS patients with diarrhea, respiratory problems, isolation should be done to prevent the transmission of community-acquired infections during dialysis.^[26] Hemodialysis staff must wear gloves, all sharp substances and needles must be disposed of properly after dialysis. The hemodialysis machine does not need to be separated. After dialysis, the outside of the machine should be cleaned with hypochlorite and the inside with formaldehyde. Patients who will receive dialysis treatment for the first time should be screened for HIV before starting treatment and HIV tests every six months. A training program on AIDS should be implemented for patients and healthcare professionals.^[27]

CONCLUSION

Considering the relatively average HCV seroprevalence in the hemodialysis center of Selçuk University hospital, it is clear that the most important risk factors are the length of the hemodialysis. The data from this study encourage us to better apply the rules of asepsis and to use recombinant human erythropoietin. The correlation between the positivity of serological markers of HBV, HIV and HCV is explained by blood transfusions hence the importance of detecting these infections and to undertake as soon as possible a vaccination against viral hepatitis B and the application of barrier measures against HIV. As a matter of fact, all these measures should make it possible to prevent contamination in dialysis centers while waiting to find passive immunization with gamma globulins or active immunization against the hepatitis C virus.

ETHICAL DECLARATIONS

Ethics Committee Approval: Ethical approval has been provided by the Ethics Committee from the Faculty of Medicine, Selçuk University (02/09/2020 – 2020/348).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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