

Seroprevalence of Hepatitis A, Hepatitis B, Hepatitis C, and HIV Among Patients Undergoing First Hemodialysis in the Emergency Department: A Retrospective Cross-Sectional Study

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Abstract

Background: Data on viral seroprevalence among patients undergoing their first hemodialysis in the emergency department (ED) are limited. This study aimed to determine the seroprevalence of HAV, HBV, HCV, and HIV in this population and to evaluate associated demographic and clinical factors.

Methods: This single-center, retrospective cross-sectional study included adult patients who underwent their first hemodialysis in a tertiary ED between July 1, 2023, and June 30, 2025. Patients receiving maintenance hemodialysis, those with a history of previous temporary hemodialysis, and those with missing data were excluded. Demographic and clinical characteristics and anti-HAV total, anti-HAV IgM, hepatitis B surface antigen (HBsAg), anti-HBc IgM, anti-HCV, and HIV antigen/antibody (Ag/Ab) results were obtained from electronic medical records.

Results: A total of 218 patients were included; 56.9% were male, and the mean age was 65.7 ± 16.9 years. Anti-HAV total positivity was detected in 47.2% of patients, HBsAg positivity in 4.1%, and anti-HCV positivity in 3.7%. No patient tested positive for anti-HAV IgM, anti-HBc IgM, or HIV Ag/Ab. Anti-HCV positivity was significantly higher among women than men (7.4% vs. 0.8%, $p=0.022$). No significant associations were identified between HBsAg or anti-HCV positivity and age, diabetes mellitus, malignancy, immunosuppression, previous surgery, or blood transfusion history.

Conclusion: The results of this study characterize the viral serological profiles of patients during their initial hemodialysis sessions. These data from a specific patient group are important for guiding infection control measures, conducting further diagnostic evaluations of patients with positive screening tests, and assessing the need for vaccination in seronegative patients.

Key words; Emergency Department, Hemodialysis, Hepatitis A, Hepatitis B, Hepatitis C, Seroprevalence

Title Page

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The authors declare that they have no competing interests.

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Introduction

Viral hepatitis remains a major global public health problem because of its substantial burden of acute and chronic liver disease and its long-term complications, including cirrhosis and hepatocellular carcinoma. According to the World Health Organization 2026 Global Hepatitis Report, approximately 240 million people worldwide were living with chronic hepatitis B virus (HBV) infection and 47 million with hepatitis C virus (HCV) infection in 2024. In the same year, approximately 1.3 million deaths were attributable to HBV- and HCV-related cirrhosis and liver cancer [1]. Although an effective vaccine against HBV is available and HCV infection is largely curable with direct-acting antivirals, limited access to diagnosis and treatment continues to contribute to the global disease burden [1].

Unlike HBV and HCV, hepatitis A virus (HAV) does not cause chronic infection and is transmitted primarily via the fecal–oral route. However, disease severity increases with age, with older individuals being at greater risk of severe disease and fulminant hepatitis [2]. Although Türkiye has historically been considered highly endemic for HAV, its epidemiological pattern has been changing with improvements in socioeconomic conditions and the introduction of the HAV vaccine into the national childhood immunization program in 2012. Recent studies indicate that Türkiye currently has moderate HAV endemicity, with seropositivity increasing substantially with age [3,4].

Human immunodeficiency virus (HIV) infection also remains an important global public health concern. An estimated 41 million people worldwide were living with HIV at the end of 2024 [5]. In Türkiye, the number of reported HIV infections has increased in recent years. According to data from the Turkish Ministry of Health, 6,132 new cases were reported in 2024, comprising 5,995 HIV cases and 137 AIDS cases [6].

Patients undergoing hemodialysis for renal failure are particularly vulnerable to blood-borne viral infections because of frequent vascular access procedures, exposure to blood and blood products, repeated contact with healthcare settings, and impaired immune function. Although the prevalence of HBV and HCV among patients undergoing hemodialysis has declined substantially in recent years owing to improvements in infection control practices, HBV vaccination, blood safety, and systematic serological screening, the risk remains higher than that in the general population [7,8].

Most available studies on this topic have focused on patients receiving chronic maintenance hemodialysis [8,9]. In contrast, data on the pre-dialysis viral serological profile of patients undergoing unplanned hemodialysis for the first time in an emergency department setting remain limited. Determining the pre-dialysis serological status of these patients is important for characterizing the existing burden of viral infections and informing infection control measures during subsequent dialysis care.

Therefore, this study aimed to determine the prevalence of serological markers of HAV, HBV, HCV, and HIV among patients undergoing hemodialysis for the first time in the emergency department and to evaluate the associations between seropositivity and selected demographic and clinical characteristics.

Methods

Study Design and Setting

This single-center, retrospective, cross-sectional observational study was conducted at the Department of Emergency Medicine, Dokuz Eylül University Faculty of Medicine. The electronic medical records of adult patients who presented to the ED and underwent hemodialysis between July 1, 2023, and June 30, 2025, were retrospectively reviewed. The study was approved by the local ethics committee (August 6, 2025; Decision No. 2025/26-22) and was conducted in accordance with the principles of the Declaration of Helsinki.

Study Population

Patients aged ≥ 18 years who presented to the ED and underwent hemodialysis during the study period were screened for eligibility. Patients undergoing hemodialysis for the first time in the ED were included in the study. Patients receiving maintenance hemodialysis, those who had previously undergone temporary hemodialysis, and those with incomplete data were excluded.

Data Collection

Demographic and clinical data were obtained from the hospital's electronic medical record system. Data on age, sex, nationality, diabetes mellitus (DM), malignancy, immunosuppression, previous surgery, and history of blood transfusion were recorded. For the viral serological assessment, the results of total anti-HAV, anti-HAV IgM, hepatitis B surface

antigen (HBsAg), anti-HBc IgM, anti-HCV, and HIV antigen/antibody (Ag/Ab) tests obtained before or at the time of the patients' first hemodialysis session were recorded. Serological analyses were performed in the hospital's central laboratory using an automated chemiluminescent immunoassay on the Alinity I immunoassay system (Abbott Laboratories, Abbott Park, IL, USA).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 29.0 (IBM Corp., Armonk, NY, USA). The distribution of continuous variables was assessed, and normally distributed continuous variables were presented as mean $\pm$ standard deviation. Categorical variables were presented as numbers and percentages. Positivity rates for HAV, HBV, HCV, and HIV serological markers were reported as numbers and percentages. Fisher's exact test was used to evaluate the associations between HBsAg or anti-HCV seropositivity and categorical demographic and clinical variables because of the low expected cell counts. The Mann–Whitney U test was used to compare continuous variables between seropositive and seronegative groups. All tests were two-sided, and a p value <0.05 was considered statistically significant. Multivariable regression analysis was not performed because of the small number of HBsAg- and anti-HCV-positive cases.

Results

A total of 462 patients aged ≥ 18 years who presented to the ED and underwent hemodialysis during the study period were screened for eligibility. Of these, 174 were excluded because they were receiving maintenance hemodialysis, 23 because they had previously undergone temporary hemodialysis, and 47 because of incomplete data. Consequently, 218 cases undergoing hemodialysis for the first time in the ED were included in the final analysis.

Of the 218 cases included in the study, 124 (56.9%) were male and 94 (43.1%) were female. The mean age was 65.7 ± 16.9 years. DM was present in 104 cases (47.7%), malignancy in 13 (6.0%), and immunosuppression in 11 (5.0%). A history of surgery was documented in 121 cases (55.5%), and 103 cases (47.2%) had a history of blood transfusion (Table 1).

Serological testing revealed total anti-HAV positivity in 103 cases (47.2%), whereas none of the cases were positive for anti-HAV IgM. HBsAg positivity was detected in 9 cases

(4.1%) and anti-HCV positivity in 8 (3.7%). Anti-HBc IgM and HIV Ag/Ab were negative in all cases (Table 2).

There was no significant difference in age between HBsAg-positive and HBsAg-negative cases ($p = 0.693$). HBsAg positivity was detected in 2.1% (2/94) of female cases and 5.6% (7/124) of male cases, with no statistically significant difference between the sexes ($p = 0.306$). Similarly, no significant associations were observed between HBsAg positivity and DM, malignancy, immunosuppression, history of surgery, or history of blood transfusion (all $p > 0.05$).

There was no significant difference in age between anti-HCV-positive and anti-HCV-negative cases ($p = 0.939$). Anti-HCV positivity was detected in 7.4% (7/94) of female cases and 0.8% (1/124) of male cases, and this difference was statistically significant ($p = 0.022$). No significant associations were observed between anti-HCV positivity and DM, malignancy, immunosuppression, history of surgery, or history of blood transfusion (all $p > 0.05$) (Table 3).

Discussion

In this study, viral serological findings were evaluated in 218 cases undergoing hemodialysis for the first time in the ED. HBsAg positivity was detected in 4.1% of cases and anti-HCV positivity in 3.7%, whereas no cases were positive for HIV Ag/Ab. No cases were positive for both HBsAg and anti-HCV. Anti-HCV positivity was significantly more frequent among female than male cases, whereas no significant associations were observed between HBsAg or anti-HCV positivity and the other demographic and clinical characteristics evaluated. An important feature of this study is its focus on cases undergoing hemodialysis for the first time rather than those receiving maintenance hemodialysis. This approach enables assessment of the viral serological status before the initiation of hemodialysis. Early identification of viral serological status in these cases is clinically important, particularly in emergency and unplanned hemodialysis settings, for implementing appropriate infection control measures and facilitating further diagnostic evaluation when indicated.

In the present study, HBsAg positivity was 4.1%, which is higher than the rates recently reported among patients receiving maintenance hemodialysis in Türkiye. According to the 2023 and 2024 registry reports of the Turkish Society of Nephrology, HBsAg positivity among hemodialysis patients was 2.45% and 2.5%, respectively [7,8]. Local data from ED populations

are also relevant when interpreting our findings. In a retrospective study of 4,799 patients who underwent serological testing in a tertiary ED in İzmir, HBsAg positivity was reported in 3.3% of the overall study population and in 2.1% of the 192 patients who underwent serological testing in the context of hemodialysis [10]. However, that study did not provide detailed information on whether patients in the hemodialysis subgroup had a history of previous dialysis or were receiving maintenance hemodialysis. Therefore, differences in HBsAg positivity rates between the studies should be interpreted with caution. In contrast, the present study specifically included cases undergoing hemodialysis for the first time, representing a more clearly defined population.

In a large-scale study of the general population in Türkiye, HBsAg positivity was reported to be 4%, which is comparable to the rate observed in the present study [11]. This finding suggests that HBsAg positivity among cases undergoing hemodialysis for the first time may be comparable to that reported in the general population. However, our study cohort represents a selected population characterized by older age, a high burden of comorbidities, and an urgent need for hemodialysis; therefore, comparisons with the general population should be interpreted cautiously.

International data also indicate considerable variation in HBsAg positivity among hemodialysis patients across countries and patient populations. A comprehensive systematic review and meta-analysis evaluating the global epidemiology of HBV infection among hemodialysis patients reported an overall HBsAg prevalence of 7.57% [12]. However, because the meta-analysis included patients with varying durations of hemodialysis exposure, the reported prevalence may not directly reflect the serological status of patients undergoing hemodialysis for the first time. Data on HBV seroprevalence at the initiation of hemodialysis remain limited. In a study from Pakistan involving 189 patients evaluated at the initiation of hemodialysis, HBsAg positivity was reported in 2.1% of patients [13]. The HBsAg positivity rate of 4.1% observed in the present study is higher than that reported in the Pakistani study but lower than the prevalence reported in the global meta-analysis of the overall hemodialysis population. These differences should be interpreted in the context of variations in HBV epidemiology and vaccination practices across countries, as well as differences in the characteristics of the populations studied and the duration of hemodialysis exposure.

In Türkiye, HBsAg positivity among hemodialysis patients was substantially higher in previous decades than that reported in recent years. While HBsAg positivity was reported to be 13.3% approximately two decades ago [14], recent national data indicate a prevalence of

approximately 2.5% [7,8]. This decline may be attributable to several factors, including the widespread implementation of HBV vaccination, improved screening of blood and blood products, increased use of disposable materials, implementation of standard infection control measures, and strengthened surveillance practices in hemodialysis units.

In the present study, anti-HCV positivity was 3.7%. This rate is higher than the corresponding rates of 2.29% and 2.2% reported among patients receiving maintenance hemodialysis in the 2023 and 2024 registry reports of the Turkish Society of Nephrology, respectively [7,8]. In contrast, substantially higher HCV seroprevalence rates (19–20.2%) were reported among hemodialysis patients in Türkiye in earlier studies [14,15]. The marked difference between recent national data and earlier studies suggests that HCV seroprevalence in the hemodialysis population has declined substantially over time. A similar trend has been observed internationally. In a multinational analysis of data from the Dialysis Outcomes and Practice Patterns Study (DOPPS), Jadoul et al. reported that HCV seroprevalence decreased over time from 14.3% to 8.7% in France, from 23.1% to 12.1% in Italy, from 21.4% to 9.1% in Spain, and from 11.5% to 6.9% in the United States, whereas it increased from 2.7% to 5.4% in the United Kingdom [16].

According to DOPPS data, HCV seroprevalence among patients who had initiated hemodialysis within the preceding 4 months was approximately 5% during the 2012–2014 period, ranging from 0.5% to 8.9% across participating countries [16]. The anti-HCV positivity rate of 3.7% observed among cases undergoing hemodialysis for the first time in our study was slightly below this overall rate and within the range reported across countries. In a recent study from northern Iran, anti-HCV results were evaluated in 470 patients at the initiation of hemodialysis, with a positivity rate of 1.28% [17]. These variations suggest that HCV seroprevalence at the initiation of hemodialysis may differ according to regional epidemiological characteristics and differences in the populations studied.

Local data provide an additional perspective. In a single-center retrospective study conducted in a tertiary ED in the same city, anti-HCV positivity was reported in 1.2% of the overall study population and 0.5% of patients undergoing hemodialysis [10]. Although the anti-HCV positivity rate observed in our study was higher, the lack of detailed information regarding previous dialysis exposure in the hemodialysis subgroup of that study, together with differences in patient selection, limits direct comparison of these rates. Rather than allowing a direct comparison of prevalence between studies, these findings highlight the potential clinical and epidemiological heterogeneity of cases undergoing hemodialysis for the first time in the ED.

HCV seroprevalence may also vary substantially according to the epidemiological and behavioral risk profile of the population studied. In the TURHEP study, anti-HCV positivity was reported in 1.0% of the general population in Türkiye [11], which is lower than the rate of 3.7% observed in our study. In contrast, a prospective study of 478 individuals with alcohol and substance use disorders reported an anti-HCV positivity rate of 9.6%, increasing to 55.7% among those who injected drugs [18]. These findings illustrate the substantial variation in HCV seroprevalence across populations with different risk profiles.

In the present study, no statistically significant associations were found between a history of blood transfusion or surgery and anti-HCV positivity. A recent study conducted in a similar patient population likewise reported no significant association between a history of blood transfusion and anti-HCV positivity, despite approximately half of the patients having a history of transfusion [17]. This finding may reflect the substantial reduction in the risk of transfusion-transmitted HCV resulting from effective HCV screening of blood donors and improvements in blood safety practices [19]. However, the inability to assess certain behavioral and epidemiological risk factors, together with the small number of anti-HCV-positive cases, limits the conclusions that can be drawn regarding these associations. Therefore, population-specific risk factors should be considered when interpreting anti-HCV positivity among cases undergoing hemodialysis for the first time.

In this study, anti-HCV positivity was significantly more frequent among female than male cases (7.4% vs. 0.8%; $p = 0.022$). However, the small number of anti-HCV-positive cases ($n = 8$) substantially limits the interpretation of this association. Given the low event count, even minor differences in the distribution of positive cases between the sexes could affect statistical significance. Therefore, the higher anti-HCV positivity observed among female cases should not be interpreted as evidence that female sex is an independent risk factor for HCV seropositivity. This finding should be interpreted cautiously and requires confirmation in larger cohorts.

No cases in the present study were positive for HIV Ag/Ab. HIV prevalence among patients receiving maintenance hemodialysis in Türkiye is known to be very low [8]. Given this low prevalence and the sample size of 218 cases, the absence of HIV Ag/Ab-positive cases in our cohort is not unexpected, despite the increasing burden of HIV reported in Türkiye and globally in recent years [5,6]. Nevertheless, this finding should not be interpreted as evidence

that HIV infection is absent among cases undergoing hemodialysis for the first time; rather, it indicates only that no HIV Ag/Ab-positive cases were identified in the present study cohort.

Total anti-HAV positivity was detected in 47.2% of cases, whereas none were positive for anti-HAV IgM. This rate is lower than the high total anti-HAV seropositivity rates previously reported in Türkiye, particularly among older age groups. Previous studies have shown that total anti-HAV seropositivity increases substantially with age and reaches high levels among older individuals [3,4,20]. The lower seropositivity observed in the present study may be related to the characteristics of the selected study population. However, because total anti-HAV positivity may reflect either previous natural infection or vaccine-induced immunity, and individual vaccination histories could not be reliably assessed retrospectively, the interpretation of this finding is limited. Nevertheless, the relatively low total anti-HAV seropositivity observed in this cohort highlights the potential importance of assessing HAV immunity status among cases undergoing hemodialysis for the first time.

This study has several limitations. First, its retrospective, single-center design limits the generalizability of the findings to other populations and settings. Second, the small numbers of HBsAg-positive and anti-HCV-positive cases limited the statistical power to evaluate associated factors and precluded the development of a reliable multivariable regression model. Third, several potentially relevant behavioral and epidemiological risk factors, including injection drug use, tattooing or piercing, high-risk sexual behavior, and household contact with individuals with HBV or HCV infection, could not be assessed because these data were not consistently available in the retrospective medical records.

Conclusion

Among cases undergoing hemodialysis for the first time in the ED, HBsAg positivity was detected in 4.1%, anti-HCV positivity in 3.7%, and total anti-HAV positivity in 47.2%, whereas no HIV Ag/Ab-positive cases were identified. The observed HBsAg and anti-HCV positivity rates suggest that blood-borne viral infections remain a clinically relevant concern in this patient population before the initiation of hemodialysis. The relatively low total anti-HAV seropositivity observed in this predominantly older population is a notable finding that warrants further investigation in larger and diverse populations.

Assessment of viral serological status at the initiation of hemodialysis may facilitate the implementation of appropriate infection control measures, further diagnostic evaluation of

cases with positive screening results, and identification of individuals who may benefit from vaccination.

List of Abbreviations

Ag/Ab: Antigen / antibody

ED: Emergency department

DM: Diabetes mellitus

DOPPS: Dialysis Outcomes and Practice Patterns Study

HAV: Hepatitis A virus

HBV: Hepatitis B virus

HBsAg: Hepatitis B surface antigen

HCV: Hepatitis C virus

HIV: Human immunodeficiency virüs

Ethics Approval

The study was approved by Dokuz Eylül University Non-Interventional Research Ethics Committee (Decision No. 2025/26-22; August 6, 2025) and was conducted in accordance with the principles of the Declaration of Helsinki. The requirement for informed consent was waived by the ethics committee because of the retrospective nature of the study.

Consent for publication

Not applicable.

Availability of data and materials

The data used in this study were accessed with permission solely for scientific research purposes and are not publicly available due to ethical and confidentiality restrictions. Researchers interested in accessing the data may submit a reasonable, scientifically justified request to the corresponding author. Requests will be evaluated in accordance with institutional policies and applicable ethical and confidentiality requirements. Data may be made available only after

obtaining the necessary approval from the relevant authorized healthcare and/or institutional authorities.

Declaration of Competing Interests

The authors declare that they have no competing interests.

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Author contributions

All authors contributed to the conception and design of the study. CA, ECB, YE, AY, KÇ and İÜ collected the data. All authors participated in data analysis and interpretation. ŞK, CA, ECB drafted the manuscript. ECB, YE, AY, KÇ and İÜ prepared tables 1-3. ŞK, CA, ECB critically revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

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Table Legends

Table 1. Demographic and clinical characteristics of the study population (n = 218).

Table 2. Prevalence of positive viral serological markers in the study population (n = 218).

Table 3. Associations of HBsAg and anti-HCV positivity with demographic and clinical characteristics

Supplementary Files

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