

REVIEW ARTICLE

State of art. Chronic Liver Damage in End-Stage Renal Disease and Hemodialysis

Estado del arte. Daño hepático crónico en Enfermedad Renal Terminal y Hemodiálisis

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Abstract

Cirrhosis, an advanced stage of liver fibrosis, has among its main causes alcohol consumption, obesity, and viral infections. In the last decade, this condition has been extensively studied in patients with chronic kidney disease (CKD) on hemodialysis (HD), a population with similar risk factors for infections. It has been shown that hepatitis C virus (HCV) not only contributes to kidney damage through multiple mechanisms, but it can also complicate CKD, increasing morbidity and mortality. This study conducted a review of the scientific literature between 2000 and 2023, covering topics such as HCV prevalence in HD CKD, liver damage progression, co-infections, direct-acting antiviral treatment, and prevention measures in HD units. Results show prevalences above 10% in developed countries and up to 60% in developing regions. In addition, hepatitis B virus and emerging viruses such as SEN and torque teno are common as co-infections in these areas. The need to standardize HD procedures, reduce blood use and promote periodic assessment of liver damage is highlighted, seeking to reduce new HCV infections by 90%.

Keywords: Hepatitis C virus; Cirrhosis, Hepatitis; Hemodialysis; direct acting antivirals

Resumen

La cirrosis, estadio avanzado de fibrosis hepática, tiene entre sus principales causas el consumo de alcohol, obesidad e infecciones virales. En la última década, esta condición ha sido ampliamente estudiada en pacientes con enfermedad renal crónica (ERC) en hemodiálisis (HD), una población con factores de riesgo similares para infecciones. Se ha demostrado que el virus de la hepatitis C (VHC) no solo contribuye al daño renal mediante múltiples mecanismos, también puede complicar la ERC, incrementando la morbilidad y mortalidad. Este estudio realizó una revisión de la literatura científica entre 2000 y 2023, abarcando temas como la prevalencia del VHC en ERC en HD, la progresión del daño hepático, coinfecciones, el tratamiento con antivirales de acción directa y las medidas de prevención en unidades de HD. Los resultados muestran prevalencias superiores al 10% en países desarrollados y hasta un 60% en regiones en vías de desarrollo. Además, el virus de la hepatitis B y virus emergentes como SEN y torque teno son comunes como coinfecciones en estas áreas. Se subraya la necesidad de estandarizar los procedimientos en HD, reducir el uso de sangre y promover la evaluación periódica del daño hepático, buscando reducir las nuevas infecciones por VHC en un 90%.

Palabras clave: Virus de la Hepatitis C; Cirrosis; Hepatitis; Hemodiálisis; antivirales de acción directa

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INTRODUCTION

Cirrhosis is the most advanced stage of liver fibrosis, and its main causes include alcohol consumption, obesity, and viral infections (Ou et al., 2024). Among viral causes, hepatitis C virus (HCV) stands out as the cause of chronic infection in approximately 70% of the cases, with a risk of cirrhosis development up to 30%. HCV infection is primarily transmitted parenterally, through blood transfusions, needle sharing among intravenous drug users, and unsafe practices in hospitals and dental offices. In Mexico, men aged fifty represent the most affected population (Panduro et al., 2011). Patients with chronic kidney disease (CKD) using peritoneal dialysis (PD) and hemodialysis (HD) are a high-risk group (Gómez-Gutiérrez, 2015).

The course of hepatitis C is usually asymptomatic, which is detected between 20 to 30 years after infection due to complications related to hepatic decompensation. However, HCV-infected CKD patients may have a more complex disease, since diagnosis is difficult due to the high frequency of occult hepatitis in this population (Timothy et al., 2020). Diagnosis of infection represents a global challenge, especially in CKD patients, who have clinical and biochemical condition like liver disease, further delaying the identification of liver damage due to symptom masking (Bruguera et al., 1990).

This review collects scientific evidence on the prevalence of HCV in CKD and HD patients, the impact on liver health, and provides a brief description of the use of direct-acting antivirals

(DAAs) for the treatment of HCV. The objective is to provide a summary of scientific evidence that contributes to increase HCV detection, promoting early diagnosis of liver damage, and reducing morbidity in this high-risk population.

METHODS, TECHNIQUES, AND INSTRUMENTS

A narrative review of the scientific literature published between 2000 and 2023, in English and Spanish, was performed, systematically consulting databases such as PubMed, Scopus, Web of Science and ScienceDirect, known for their scientific rigor and broad coverage in biomedical sciences.

The literature search was designed based on recommendations of quality criteria for narrative reviews (Baethge et al., 2019), to ensure the relevance and comprehensiveness of the collected information. The following were used as key words and controlled descriptors (MeSH and DeCS): Hemodialysis, Hepatitis C Virus, Chronic Liver Damage, Viral Infections and Blood Transfusions. Boolean operators were used to expand search sensitivity: (“Hepatitis C Virus” AND “Hemodialysis”) OR (“Hepatic Damage” AND “End-Stage Renal Disease”).

The search process yielded 487 initial articles. Following the application of inclusion and exclusion criteria, sixty-five duplicates were removed, and 380 articles were discarded since they did not meet the objectives of the study, leaving forty-two articles to be included for detailed analysis. These studies were

the basis of this review, with an emphasis on three main axes: HCV prevalence in patients with HD CKD, mechanisms of liver damage progression, and DAA efficacy in this population. This procedure enabled integration of a broad, up-to-date, and critical picture of the impact of HCV in CKD patients undergoing hemodialysis, following internationally recognized methodological standards for high-quality narrative reviews.

PREVALENCE OF HCV IN HEMODIALYSIS PATIENTS

The overall prevalence of HCV in patients with CKD on hemodialysis has been evaluated by epidemiological studies, being in the range of 24.3%, with significant regional variations. In Eastern Europe, a prevalence of 48.6% has been reported; in Indonesia, of 63.6%, and an overall mortality rate of 38.7% (Kenfack et al., 2024). In high-income countries, such as the United States, Japan, and England, the average prevalence is 13.5%, ranging from 2.6% to 22.9%.

This variability is primarily associated with the time on hemodialysis, male sex, African descent race, diabetes, co-infection with hepatitis B virus (HBV), kidney transplant, and alcohol or illicit substance use in the past 12 months (Fissell et al., 2004). A meta-analysis of studies conducted in Latin America estimated a prevalence of hepatitis C in CKD and hemodialysis of 10.7%, with rates ranging from 26.1% in Argentina to 6% in Brazil (Huarez et al., 2022).

HCV TRANSMISSION MECHANISMS ON HEMODIALYSIS

The hemodialysis procedure involves frequent manipulation of the circulatory system, increasing the risk of transmission of infections. HCV is transmitted by contact with contaminated blood, transfusions, or dialysis equipment not properly disinfected. The regulation of blood handling and disposal practices in many countries has significantly reduced transfusion-borne pathogens; However, in countries where blood banks do not routinely test for HCV, transfusions remain a source of risk (Jadoul et al., 2019). In resource-limited regions, the reuse of dialysis equipment is a key factor in HCV transmission, increasing the risk of cross-transmission if strict disinfection protocols are not enforced. Inadequate infection control practices during vascular access also pose a considerable risk (Pavlina et al., 2018).

HEPATITIS C AND HEMODIALYSIS

The World Health Organization (WHO) estimates that approximately fifty-eight million people have hepatitis C, turning it into a public health problem, particularly in developing countries and in vulnerable populations such as hemodialysis patients (WHO, 2023). The relationship between CKD on hemodialysis and HCV is well known; in India, the detection in hemodialysis patients is critical for a timely treatment, reducing the risk of progression to an advanced liver damage and hepatocellular carcinoma (Kalita et al., 2021). In Peru, an HCV prevalence of 35.1% has been reported in hemodialysis patients, of which 20.11% had viral load (Padilla-Machaca et al., 2022).

CO-INFECTIONS AND OTHER RISK FACTORS

Co-infection with other viruses, such as HBV, SEN virus (SENV), and torque teno virus (TTV), complicates the management of HCV patients on hemodialysis. In Egypt, 50.8% of HCV patients on hemodialysis presented an occult HBV infection, 29% by TTV, and 11.5% by SENV (Amer et al., 2019).

Progression of liver damage in patients with HCV In patients with CKD and hemodialysis, HCV infection tends to rapidly progress into cirrhosis, liver failure, and hepatocellular carcinoma, in part due to elevated viral loads and compromised immune function secondary to CKD. Co-infection with other hepatotropic viruses, such as HBV and SEN-V, may further accelerate this progression (Bruguera et al., 1990).

TREATMENT AND MANAGEMENT OF HEPATITIS C ON HEMODIALYSIS

Treatment of hepatitis C in patients with CKD and hemodialysis has progressed significantly in recent years. Direct-acting antivirals (DAAs) have proved to be highly effective, achieving sustained viral response rates greater than 90%. These treatments, free of interferon and ribavirin, are pangenotypic and do not require viral genotyping for drug selection.

In addition, they allow for the estimation of liver fibrosis by indirect indices, such as FIB-4 and APRI, which are useful in this population where a liver biopsy is often counterindicated. DAAs present a

fixed combination of target-specific and safe molecules, validated in studies that included patients with CKD and hemodialysis (Akil et al., 2023).

RESULTS AND DISCUSSION

The prevalence of hepatitis C virus (HCV) infection in patients with chronic kidney disease (CKD) and undergoing hemodialysis (HD) is high and represents an important risk factor for the development of chronic liver damage. According to Carnalla et al. (2022), transmission mechanisms associated with HD and transfusion procedures increase the risk of infection.

Despite improvements in infection control practices in recent decades, infection rates in resource-limited countries remain high, reflecting the need to strengthen preventive practices in these settings (Greeviroj et al., 2022). Table 1.

Table 1. Recommended Protocols for HCV Control in HD Centers		
Protocol	Description	Source
Dedicated Equipment	Using separate machines	HCV Pavlina et al., 2018
Disinfection Protocols	Rigorous cleaning of equipment and areas	of CDC, 2023

Patients with HD HCV infection often have co-infections with other hepatotropic viruses, such as hepatitis B virus (HBV), SEN-V, and TTV, aggravating liver damage and accelerating the progression to conditions such as cirrhosis and hepatocellular carcinoma. In particular, HBV co-infection increases mortality in these patients,

highlighting the importance of implementing systematic vaccination and screening programs in at-risk populations (Fabrizi et al., 2021).

In developing countries, where health infrastructure is limited, there are significant challenges to the prevention and control of hepatitis C virus (HCV) in hemodialysis (HD) centers.

Best practices include the use of dedicated HD equipment for HCV patients, as well as the implementation of rigorous disinfection protocols. In addition, it is necessary to reduce unnecessary blood transfusions, as they represent a considerable source of virus transmission in regions where blood banks do not perform systematic testing for HCV (Pavlina et al., 2018).

CONCLUSIONS

In Mexico, advances in the detection and control of HCV in the general population have been limited, hence, strategies are required to increase the number of tests in risk groups, such as HD patients. This includes applying CDC recommendations, which propose screening all adults for HCV antibodies at least once in a lifetime (CDC, 2023).

Further research on interactions between HCV and other hepatotropic viruses is needed, as co-infections with viruses such as HBV, V-SEN, and TTV pose additional risks, especially in regions such as Asia and Africa. Such co-infections may aggravate liver damage in patients, highlighting the importance of establishing appropriate vaccination and screening programs for these viruses in vulnerable populations.

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