Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

Title:
The role of immigration in chronic hepatitis B and C in Asturias — Origin and characteristics of the patients. An observational, cross-sectional study

Authors:
Ángela Suárez-Noya, Carmen Álvarez-Navascués , Mercedes Rodríguez, Valle Cadahía-Rodrigo, Lissa Franco, Andrés Castaño-García , Susana Rojo-Alba, María Varela , María Luisa González-Diéguez, Manuel Rodríguez

DOI: 10.17235/reed.2025.11373/2025
Link: PubMed (Epub ahead of print)

Please cite this article as:
Suárez-Noya Ángela, Álvarez-Navascués Carmen, Rodríguez Mercedes, Cadahía-Rodrigo Valle , Franco Lissa, Castaño-García Andrés , Rojo-Alba Susana, Varela María, González-Diéguez María Luisa, Rodríguez Manuel . The role of immigration in chronic hepatitis B and C in Asturias — Origin and characteristics of the patients. An observational, cross-sectional study. Rev Esp Enferm Dig 2025. doi: 10.17235/reed.2025.11373/2025.

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

The role of immigration in chronic hepatitis B and C in Asturias: origin and characteristics of the patients. An observational, cross-sectional study.

Study population

Participants

- ✓ All patients attended for chronic hepatitis B (CHB) (n= 758) and chronic hepatitis C (CHC) (n= 1,673).
- ✓ Between January 2014 - December 2023.

Methods

Study design

- ✓ Observational, descriptive, and cross-sectional study.

Endpoints

- ✓ Proportion of immigrants and their origin among patients with CHB and CHC.
- ✓ Clinical and epidemiological characteristics of immigrants with CHB y CHC, and comparison between both groups.

Outcomes

- ✓ The proportion of immigrants was 38.8% (294/758) at CHB and 5.6% (94/1,673) at CHC (p<0.001).
- ✓ The country with the highest number of cases of both infections was Romania.
- ✓ The geographic area with the highest proportion of CHB was sub-Saharan Africa (33.3%), and for CHC it was Eastern Europe (40.4%).
- ✓ The main known mechanism of infection was vertical-familial transmission (28.2%) in CHB and injecting drug use (21.3%) in CHC.
- ✓ Immigrants with CHC were older, consumed alcohol more frequently and had a more advanced liver disease.

Suárez-Noya Á, et al.

Revista Española de Enfermedades Digestivas (REED)
The Spanish Journal of Gastroenterology

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

The role of immigration in chronic hepatitis B and C in Asturias — Origin and characteristics of the patients. An observational, cross-sectional study

Ángela Suárez-Noya[1] (angelasuareznoya@gmail.com), Carmen Álvarez-Navascués[1] (canavascues99@movistar.es), Mercedes Rodríguez[2] (mercedes.rodriguezp@sespa.es), Valle Cadahía-Rodrigo[1] (vallecadahiarodrigo@gmail.com), Lissa Franco[1] (francolissa@gmail.com), Andrés García-Castaño[1] (castaogarcia@gmail.com), Susana Rojo-Alba[2] (ssmrj4@gmail.com), María Varela[1,3,4] (maria.varela.calvo@gmail.com), Luisa González-Diéguez[1] (luisagondi@hotmail.com), Manuel Rodríguez[1,3,4] (manurodrigg@gmail.com)

[1]Hepatology Section, Department of Gastroenterology. [2]Department of Microbiology. Hospital Universitario Central de Asturias. Oviedo, Spain. [3]University of Oviedo. Oviedo, Spain. [4]Instituto de Investigación del Principado de Asturias (ISPA). Oviedo, Spain.

CORRESPONDING AUTHOR:

Ángela Suárez Noya

Calle Novoa Santos, 16, 4ºG, 15006, A Coruña, Galicia, Spain.

angelasuareznoya@gmail.com

ABBREVIATIONS LIST:

HBV: Hepatitis B virus. HCV: Hepatitis C virus. WHO: World Health Organisation. HCC: Hepatocellular carcinoma. SSA: Sub-Saharan Africa. ASP: Asia-Pacific. EE: Eastern Europe. DAAs: Direct-acting antivirals. CHB: Chronic hepatitis B. CHC: Chronic hepatitis C. HBsAg: Hepatitis B surface antigen. Anti-HBc: antibody against hepatitis B core antigen. TE: Transient elastography. kPa: kilopascals. HIV: human immunodeficiency virus. HBeAg: Hepatitis B e antigen. IDU: Injecting Drug User. BMI: Body mass index. HDV: Hepatitis Delta virus.

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

ABSTRACT

Objective: To understand the burden of immigration in chronic hepatitis B (CHB) and C (CHC) in our setting and the characteristics of immigrants with each infection.

Materials and Methods: An observational, descriptive, and cross-sectional study that included all patients attended for CHB (n=758) and CHC (n=1,673) between January 2014 and December 2023. Demographic, epidemiological, and clinical variables were analyzed.

Results: The proportion of immigrants was higher in CHB than in CHC (38.8% vs. 5.6%; P<0.001), as well as among incident cases compared to prevalent ones, both in CHB (60.7% vs. 23.1%; p<0.001) and CHC (7.8% vs. 2.6%; p<0.001). The geographic area with the highest proportion of CHB was sub-Saharan Africa (33.3%), and for CHC it was Eastern Europe (40.4%). The main known mechanism of infection was vertical-familial transmission (28.2%) in CHB and injecting drug use (21.3%) in CHC. Compared with those with CHB, immigrants with CHC were older (51.6 vs. 34 years; p<0.001), consumed alcohol more frequently (16% vs. 3.7%; p<0.001), had a higher BMI (26.7 vs. 24.5 kg/m^2; p=0.03), and greater liver stiffness (7.9 vs. 5.2 kPa; p<0.001) evaluated by transient elastography.

Conclusions: Immigration plays a growing role in hepatitis B and C in our setting, making systematic screening in this population necessary. Although the impact of immigration is much greater in CHB than in CHC, immigrants with CHC present a more advanced stage of liver fibrosis.

KEYWORDS: Human viral hepatitis. Hepatitis B. Hepatitis C. Immigration.

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

LAY SUMMARY

In this study, the influence of immigration on chronic hepatitis B and C cases is analyzed. It included 758 individuals with hepatitis B and 1,673 with hepatitis C attended between 2014 and 2023 at the Hospital Universitario Central de Asturias. The results show that the proportion of immigrants was higher in hepatitis B (38.8%) than in hepatitis C (5.6%), and also among new cases diagnosed during the study period compared to previously known cases in both infections. Regarding the origin of immigrants, one-third of hepatitis B cases came from sub-Saharan Africa, while in hepatitis C, those from Eastern Europe predominated. In hepatitis B, the main mechanism of infection acquisition was vertical-familial, whereas in hepatitis C, it was injecting drug use. Immigrants with hepatitis C were older, had higher alcohol consumption, a higher body mass index, and exhibited more liver damage, measured by elastography. These results highlight the important role of immigration in chronic infections by both viruses, especially in hepatitis B, with direct implications for clinical practice, particularly in primary care, infectious disease units, and hepatology. They emphasize the need for systematic testing to detect these infections in immigrants, regardless of the presence of symptoms or known medical history, as many may not know they are infected. Additionally, in the case of hepatitis C, where identified cases present greater liver damage and risk factors such as alcohol consumption or a higher body mass index, professionals should pay more attention to signs of disease progression in these patients. In both cases, timely detection through accessible serological tests, along with early referral to specialized units, allows for effective treatment and prevention of severe complications such as cirrhosis or liver cancer.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data used and analyzed in this study are available from the corresponding author upon request.

INTRODUCTION

Infection by hepatitis B (HBV) and C (HCV) viruses are global public health problems. Differences based on geographical origin, access to healthcare systems, and patients' epidemiological and clinical characteristics affect their prevalence, management, and clinical outcomes.

According to the World Health Organization (WHO), in 2022, there were an estimated 254 million people living with HBV infection, with 1.2 million new infections and 1.1 million deaths, mainly due to cirrhosis or hepatocellular carcinoma (HCC).[1] This infection is endemic in sub-Saharan Africa (SSA) and the Asia-Pacific (ASP) region.[2,3] Despite the WHO goal of eliminating viral hepatitis as a public health problem by 2030,[4] a 39% increase in HBV mortality is expected between 2015 and 2030.[5]

HCV infection remains a problem in many regions of the world. Despite smaller geographical differences than in HBV, areas such as SSA, Central and Eastern Asia, Eastern Europe (EE), and Egypt have a high prevalence.[6] Although the introduction of direct-acting antivirals (DAAs) has reduced its prevalence, the WHO estimates 50 million chronic infections, an annual incidence of 1 million new cases, and 242,000 deaths in 2022.[1] The global strategy for HCV elimination by 2030, proposed by the WHO in 2016, aims to achieve a 90% reduction in CHC incidence, a 65% reduction in mortality, and treatment of 80% of people with active infection.[4]

In Spain, HBV chronic infection prevalence has decreased due to universal vaccination programs, with the current hepatitis B surface antigen (HBsAg) carrier rate at 0.22% and the rate of viremic infections at 0.05%.[7] HCV prevalence has also declined due to DAAs, with a weighted active infection prevalence of 0.22% in the population.[7] Nonetheless, geographical differences in prevalence make migratory movements highly relevant to the epidemiology of both infections.

This study aims to assess the impact of immigration on chronic hepatitis B (CHB) and C (CHC) in our environment and to analyze the characteristics of immigrants with each condition.

MATERIAL AND METHODS

An observational, descriptive, cross-sectional study was conducted in the Sanitary Area IV of the Principado de Asturias. In 2022, 5.3% of the population over 16 years of this area was immigrant.[8] We analyzed all patients over 17 years attended for CHB and CHC from January 2014 to December 2023 in the Hepatology Section of the Hospital Universitario Central de Asturias, the head of Area IV. CHB diagnosis was based on serum HBsAg presence for more than 6 months and CHC on HCV-RNA positivity in plasma or serum. The presence of antibodies against the HVB core antigen (anti-HBc), in the absence of HBsAg, defined resolved HBV infection in CHC patients.

To determine if there were changes in the impact of immigration on CHB and CHC, cases were classified as prevalent if they were first attended before January 2014 and as incident when the first consultation took place between January 2014 and December 2023. In all cases, periodic follow-up was conducted, with intervals varying according to clinical status. Demographic, epidemiological, and clinical variables were collected prospectively. Clinical history, laboratory studies, and abdominal ultrasound were performed in all. Liver fibrosis stage was evaluated using transient elastography (TE) (Fibroscan Echosens®) and expressed in kilopascals (kPa).

The phases of HBV infection were defined according to the Spanish Association for the Study of the Liver Consensus Document.[9] In all CHB patients, the HBV e antigen (HBeAg) and its antibody, HBV-DNA, and antibodies against the hepatitis D virus (anti-HDV) were determined. HDV-RNA was analyzed in all anti-HDV positive subjects. Antibodies against the human immunodeficiency virus (HIV) were determined in all cases. Genomic studies were conducted using polymerase chain reaction techniques. In all CHC cases and those with CHB and high viral load (59.9%), the viral genotype was determined by genomic sequencing.

Immigrants' countries of birth were grouped into geographic areas, and characteristics of immigrants with CHB and CHC from those with the highest number of cases were analyzed and compared. A relationship was established between the number of CHB and CHC cases from each country and the number of immigrants from the same country residing in area IV, according to the 2022 Asturias Health Map Demographic Update,[8] to estimate which had a higher proportion of immigrants diagnosed with CHB or CHC. Finally, the main characteristics between immigrants with CHB and CHC were compared.

Quantitative variables were expressed as medians and interquartile ranges and compared using the Mann-Whitney U test. Categorical variables were expressed as percentages, using the Chi-square test for comparisons. Statistical analysis was performed using SPSS 20.0® (Chicago, IL). The study protocol adhered to the principles of the Declaration of Helsinki and was approved by the Research Ethics Committee of the Principado de Asturias, with exemption from informed consent for retrospective use of clinical data. Data analysis was performed anonymously in accordance with the European Union General Data Protection Regulation (2016/679).

RESULTS

We analyzed 2,431 patients, 758 with CHB and 1,673 with CHC. Of those with CHB, 442 (58.3%) were prevalent, and 316 (41.7%) were incident. In CHC, 717 (42.9%) were prevalent, and 956 (57.1%) were incident.

Proportion of immigrants in CHB and CHC patients

The proportion of immigrants was 38.8% (294/758) in CHB and 5.6% (94/1,673) in CHC ($p<0.001$). Analyzing incident and prevalent cases, a higher proportion of immigrants was observed among incident cases, both in CHB [60.7% (192/316) vs 23.1% (102/442); $p<0.001$] and in CHC [7.8% (75/956) vs. 2.6% (19/717); $p<0.001$]. Only one of the 388 (0.25%) immigrants presented active infection by both viruses.

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

Origin of immigrants with CHB and CHC

Those with CHB originated from 36 different countries, with the highest number of cases from Romania (n=56), Senegal (n=53), China (n=40), Equatorial Guinea (n=22), Dominican Republic (n=17), and Portugal (n=17). In CHC, they came from 29 different countries, with the most cases from Romania (n=14), Equatorial Guinea (n=14), Dominican Republic (n=9), Russia (n=9), and Portugal (n=9).

Geographically, in CHB, 98 (33.3%) originated from SSA, 79 (26.9%) from EE, and 43 (14.6%) from the ASP area. In CHC, 38 (40.4%) were from EE, 15 (16%) from SSA, followed by Central America-Caribbean, South America, and Western Europe, with 12 (12.8%) each.

Considering the number of immigrants in our area and their origin, Equatorial Guinea had the highest estimated proportion of immigrant population diagnosed with CHB and CHC, at 21.4% and 13.6% respectively (*Figure 1*).

Characteristics of immigrants with CHB

Among the 294 immigrants with CHB, 55.1% were male, and the median age was 34 years. The main known acquisition mechanism was vertical or intrafamilial transmission (28.2%); no history of injecting drug use (IDU) was recorded. HBeAg was positive in 15.3%, and the most common genotypes were D (30.1%) and A (25.5%). Anti-HDV was present in 23 cases (7.8%), although only 39.1% of them had active HDV infection. TE was >9 kPa in 10.4%, and 8.2% were diagnosed with cirrhosis. *Table 1* shows these results and the characteristics of CHB immigrants from the three geographic areas with the highest number of cases and their comparison.

Characteristics of immigrants with CHC

Of the 94 immigrants with CHC, 54.3% were male, and the median age was 51.6 years. The main known acquisition mechanisms were IDU (21.4%) and blood transfusion (19.1%). The most common genotypes were 1b (38.3%), 1a (25.5%), and 3 (18.1%). Nearly half of the patients (42.6%) had anti-HBc, and 16% recognized harmful alcohol use. TE was >9 kPa in 42.7%, 25.5% had cirrhosis, and 92.5% received DAA treatment (*Table 2*). The main characteristics of CHC immigrants from the two geographic areas with the largest number of cases and their comparison are also shown in *Table 2*.

Comparison between immigrants with CHB and CHC

Table 3 shows the results of the comparison between immigrants with CHB and CHC. Those with CHC were older ($p<0.001$), more frequently had harmful alcohol use ($p<0.001$), had a higher body mass index (BMI) ($p=0.003$), higher TE values ($p=0.003$), and a higher rate of cirrhosis ($p<0.001$) and antiviral treatment ($p<0.001$).

DISCUSSION

The study results highlight the importance of immigration in the epidemiology of CHB and CHC in our setting. The proportion of immigrants was significantly higher in CHB, likely due to its high prevalence in large geographic areas around the world.[6] However, in both infections, the impact is increasing, with a significant rise in the proportion of immigrants in incident cases compared to prevalent ones. This is due to an increase in the immigrant population in our area,[8] but also likely due to the progressive decline in new cases, especially of HBV, among those born in Spain.

In CHB, the proportion of immigrants increased from 23.1% in prevalent cases to 60.7% in incident, while in CHC these rates increased from 2.6% to 7.8%; all rates exceeded those of immigrants in the general population of our area. The impact of immigration on CHB between 2014-2023 was clearly higher than the 25% estimated for Spain in a European study based on the migrant population and their origin using 2015 data.[10] However, the rate was very similar to those observed in a study

conducted in Madrid in 2007-2009 on hospital cases,[10] another Spanish multicentric study conducted in 2015 on pregnant women,[12] and one carried out in Valencia as part of an opportunistic screening.[12] On the other hand, studies conducted in the general population have shown lower rates,[14] likely due to lower access of the immigrant population to such studies. Regarding CHC, the observed rate was lower than the estimated for Spain by the *European Centre for Disease Prevention and Control* using data from the migrant population and their origin in 2013,[15] as well as those observed in two opportunistic screenings conducted in Almería[16] and Valencia,[13] and another recent study also conducted in Valencia based on case detection through an automatic alert system,[17] but it was similar to that observed in a study conducted in the Spanish general population in 2018.[18]

The impact of immigration on CHB and CHC depends on both the immigrant rate and the prevalence in their countries of origin. The lower rate of immigrants in CHC observed in Asturias compared to other areas of Spain may be due to a smaller number of immigrants from countries with high prevalence.[6] In our study, as in others,[11,19] Romania was the country of birth with the highest number of cases for both infections, due to the high prevalence of CHB (3.5%-4.5%)[6,20] and CHC (2.5%)[6] in its population and its significant representation in the migrant population in our area.[8] In CHB, Romania was followed by Senegal and China, countries with a clearly lower number of migrants, but with infection prevalence above 6%.[6] Equatorial Guinea was the fourth country with most CHB cases, the first along with Romania for CHC, and the one with the highest estimated prevalence of both infections in our area; data consistent with the results observed by Rivas et al. in a study conducted on immigrants from Equatorial Guinea residing in Spain.[21]

Regarding geographic areas with the highest number of CHB cases, these were SSA, EE, and ASP, all with high CHB prevalence in their populations.[6] A study conducted in Almería on African immigrants showed a CHB prevalence of 25.3%.[22] In CHC, the most represented geographic area was EE, although fewer differences were observed between areas, due to smaller geographic differences in CHC prevalence. A recent meta-analysis revealed an anti-HCV prevalence in the migrant population residing in

Spain of 1.6%, with SSA and Europe being the areas of origin with the highest prevalence.[23] Another study estimated that in Asturias, 1.67% of the immigrant population would have anti-HCV, based on the number of immigrants and their origin using 2016 data.[24]

The geographic area of origin influences demographic, epidemiological, and clinical aspects. Asian immigrants with CHB typically had vertical or intrafamilial transmission, a high HBeAg positivity rate, and predominance of genotypes B and C, aligning with the natural history of CHB in Asia.[25] In CHC, differences were observed between immigrants from EE and SSA; the former were younger, with a more frequent history of IDU and predominance of genotypes 1 and 3; while those from SSA more often had genotype 4, showed a high rate of past HBV infection, and higher TE values, probably due to their older age.

Regarding HDV infection, 7.8% of migrants with CHB had anti-HDV, confirming the importance of immigration in this type of hepatitis in our setting.[26] Notably, no patients with anti-HDV were from Asia, consistent with the low prevalence of HDV in China,[27] the country of origin for most Asian immigrants in our area. Also noteworthy is the low HDV-RNA positivity rate, 39%, clearly lower than the 60-80% estimated in most countries,[27] probably due to the systematic determination of anti-HDV in our series, regardless of the presence or absence of liver disease.

Compared to CHB, CHC immigrants had higher TE values and a higher prevalence of cirrhosis, probably due to the natural history of both diseases, but also due to older age and the presence of cofactors such as alcohol consumption or higher BMI.

Finally, one of the most significant challenges in this population is achieving good adherence to follow-up and access to antiviral treatment. WHO estimates that only 13% of people with CHB are diagnosed and less than 3% treated.[28] In our series, one-third of CHB immigrants received treatment, matching the proportion of patients in the chronic hepatitis phases, with a higher treatment rate in Asians due to a higher prevalence of HBeAg-positive chronic hepatitis. On the other hand, more than 90% of CHC immigrants received DAA treatment, similar to rates reported in other studies conducted in Spain.[29] Early detection of these infections in this population improves

access to treatment and reduces disease progression.[30]

The main limitation of our study is that it does not include the entire immigrant population diagnosed with CHB and CHC in our Community, but only those whose care depends on Area IV, which covers the assistance of just over a third of the Community's population.[8] Additionally, it is very likely that the immigrant population, especially those undocumented, is underrepresented in this study, despite the fact that in Asturias, immigrants, regardless of their administrative status, have the right to receive public healthcare. Another limitation is the potential bias that could arise from analyzing a hospital series, although our experience indicates that the vast majority of patients diagnosed with CHB and CHC in the public system of our Community are treated in specialized hospital units. Despite these limitations, we believe this study provides useful epidemiological data to guide public health interventions at both the regional and national levels, supporting the importance of implementing systematic screening for HBV and HCV, especially in immigrants from regions with medium or high prevalence, as a cost-effective strategy. In this regard, the HCV infection screening guidelines from the Ministry of Health recommend screening all individuals from countries with medium (2-4.9%) or high (≥5%) HCV prevalence.[31] However, Asturias is still one of the few regions without a specific plan for the elimination of HCV with defined pathways for accessing screening for this population. In the case of HBV, there is no regional or national plan aimed at its elimination; such a plan should be considered in line with WHO strategies, prioritizing prevention through educational interventions, targeted screening of vulnerable populations like immigrants, and accessible treatment by reinforcement Primary Care, eliminating bureaucratic requirements, or collaborating with intercultural mediators, thus promoting the removal of cultural and administrative barriers.

REFERENCES

1. World Health Organization. Guidelines for the care and treatment of persons diagnosed with chronic hepatitis C virus infection [Internet]. Geneva: World Health Organization; 2018. Available at: https://www.who.int/publications/i/item/9789241550345 [Accessed: 3 February 2025]
2. MacLachlan JH, Cowie BC. Hepatitis B virus epidemiology. Cold Spring Harb Perspect Med 2015;5:a021410.
3. Sharma S, Carballo M, Feld JJ, Janssen HL. Immigration and viral hepatitis. J Hepatol 2015;63:515-522. DOI: 10.1016/j.jhep.2015.04.026
4. World Health Organization. Combating hepatitis B and C to reach elimination by 2030 [Internet]. Geneva: World Health Organization; 2016. Available at: https://www.who.int/publications/i/item/combating-hepatitis-b-and-c-to-reach-elimination-by-2030 [Accessed: 3 February 2025]
5. Hsu YC, Huang DQ, Nguyen MH. Global burden of hepatitis B virus: current status, missed opportunities and a call for action. Nat Rev Gastroenterol Hepatol 2023;20:524–37.
6. Polaris Observatory HCV Collaborators. Global change in hepatitis C virus prevalence and cascade of care between 2015 and 2020: a modelling study. Lancet Gastroenterol Hepatol 2022;7:396-415. DOI: 10.1016/S2468-1253(21)00472-6.
7. Ministerio de Sanidad. 2.º Estudio de seroprevalencia en España (ENE-COVID): Enfermedades inmunoprevenibles. Informe preliminar [Internet]. Madrid: Gobierno de España; 2020. Available at: https://www.sanidad.gob.es/areas/promocionPrevencion/vacunaciones/comoTrab

ajamos/docs/EstudioSeroprevalencia_EnfermedadesInmunoprevenibles.pdf [Accessed: 25 April 2025]

8. Dirección General de Política y Planificación Sanitarias. Actualización demográfica del Mapa Sanitario de Asturias 2022 [Internet]. Oviedo: Consejería de Salud, Gobierno del Principado de Asturias; 2022. Available at: https://www.asturias.es/documents/291579/1756948/IME_06_018.pdf/a9ae47b0-eb20-8a0b-63e1-6fb885c2f3f2 [Accessed: 25 April 2025]
9. Rodríguez M, Buti M, Esteban R, et al. Consensus document of the Spanish Association for Study of the Liver on the treatment of hepatitis B virus infection (2020). Gastroenterol Hepatol 2020;43:559-587. DOI: 10.1016/j.gastrohep.2020.03.011.
10. Ahmad AA, Falla AM, Duffell E, et al. Estimating the scale of chronic hepatitis B virus infection among migrants in EU/EEA countries. BMC Infect Dis 2018;18:34. DOI: 10.1186/s12879-017-2921-8.
11. Poves-Martínez E, del Pozo-Prieto D, Costero-Pastor B, et al. Diagnostic incidence of the presence of positive HBsAg: epidemiologic, clinical, and virological characteristics. Rev Esp Enferm Dig 2012;104:10-15. DOI: 10.4321/s1130-01082012000100003.
12. Ruiz-Extremera Á, Díaz-Alcázar MDM, Muñoz-Gámez JA, et al. Seroprevalence and epidemiology of hepatitis B and C viruses in pregnant women in Spain. Risk factors for vertical transmission. PLoS One 2020;15:e0233528. DOI: 10.1371/journal.pone.0233528.
13. Ortega González E, Ocete Mochón MD, Gimeno Cardona C, et al. Opportunistic population screening as a hepatitis elimination strategy: the CRIVALVIR-FOCUS program. Int J Infect Dis 2024;146:107131. DOI: 10.1016/j.ijid.2024.107131.
14. Cuadrado A, Perelló C, Cabezas J, et al. Update on epidemiology of hepatitis B in a low-endemic European country: there is still much to do. J Viral Hepat 2020;27:1261-1265. DOI:10.1111/jvh.13350
15. European Centre for Disease Prevention and Control. Epidemiological assessment of hepatitis B and C among migrants in the EU/EEA. Stockholm: ECDC; 2016. Available at: www.ecdc.europa.eu/ [Accessed: 25 April 2025]

16. Camelo-Castillo A, Jordán Madrid T, Cabezas Fernández T, et al. Opportunistic screening for hepatitis C virus infection in an emergency department in Almeria, Spain. Emergencias 2024;36:25-32. DOI: 10.55633/s3me/03.2023.

17. Latorre Sánchez M, Castelló Mirallés I, García Deltoro M, et al. Current characteristics of patients with hepatitis C virus: results from an automated alert system. Rev Esp Enferm Dig 2025;117:222-223. DOI: 10.17235/reed.2024.10366/2024.

18. Estirado Gómez A, Justo Gil S, Limia A, et al; Working group of the HCV prevalence study in Spain in 2017–2018. Prevalence and undiagnosed fraction of hepatitis C infection in 2018 in Spain: results from a national population-based survey. Eur J Public Health 2021;31:1117-1122. DOI: 10.1093/eurpub/ckab069.

19. Falla AM, Ahmad AA, Duffell E, et al. Estimating the scale of chronic hepatitis C virus infection in the EU/EEA: a focus on migrants from anti-HCV endemic countries. BMC Infect Dis 2018;18:42. DOI :10.1186/s12879-017-2908-5

20. Gheorghe L, Csiki IE, Iacob S, et al. The prevalence and risk factors of hepatitis B virus infection in an adult population in Romania: a nationwide survey. Eur J Gastroenterol Hepatol 2013;25:56-64. DOI: 10.1097/MEG.0b013e328358b0bb

21. Rivas P, Herrero MD, Poveda E, et al. Hepatitis B, C, and D and HIV infections among immigrants from Equatorial Guinea living in Spain. Am J Trop Med Hyg 2013;88:789-794.

22. Cuenca-Gómez JA, Salas-Coronas J, Soriano-Pérez MJ, et al. Viral hepatitis and immigration: A challenge for the healthcare system. Rev Clin Esp (Barc) 2016;216:248-252. DOI: 10.1016/j.rce.2016.02.005.

23. Lazarus JV , Bromberg DJ , Del Amo J, et al. Hepatitis C prevalence among the migrant population in Spain: A systematic review and meta-analysis. Enferm Infecc Microbiol Clin 2019;37:222-230. DOI: 10.1016/j.eimc.2018.04.002.

24. Alarcón Linares ME, Romay Barja M, Torres Cantero A, et al. Review of hepatitis C screening programs for immigrants in Spain from endemic countries. Rev Esp Enferm Dig 2021;113:7-13. DOI: 10.17235/reed.2020.6916/2020.

25. Sarin SK, Kumar M, Lau GK, et al. Asian-Pacific clinical practice guidelines on the management of hepatitis B: a 2015 update. Hepatol Int 2016;10:1-98. DOI:

10.1007/s12072-015-9675-4.

26. Ordieres C, Navascués CA, González-Diéguez ML, et al. Prevalence and epidemiology of hepatitis D among patients with chronic hepatitis B virus infection: a report from Northern Spain. Eur J Gastroenterol Hepatol 2017;29:277-283. DOI: 10.1097/MEG.0000000000000795.

27. Polaris Observatory Collaborators. Adjusted estimate of the prevalence of hepatitis delta virus in 25 countries and territories. J Hepatol 2024;80:232-242.

28. World Health Organization. Global hepatitis report 2024: action for access in low- and middle-income countries. World Health Organization, Geneva, 2024. https://www.who.int/publications/i/item/9789240091672. [Accessed: 3 February 2025]

29. Estévez Escobar M, Casado Martín M, Moreno Moraleda I, et al. Experience in the treatment of hepatitis C with direct-acting antivirals in a foreign population at a high-immigration area. Rev Esp Enferm Dig 2021;113:704-708. DOI: 10.17235/reed.2021.7830/2021.

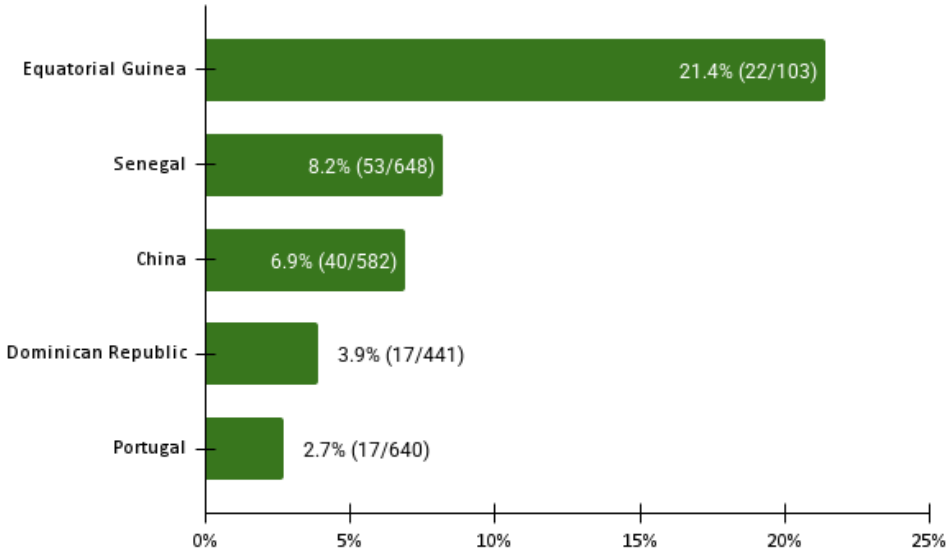
30. Suijkerbuijk AWM, van Hoek AJ, Koopsen J, et al. (2018) Cost-effectiveness of screening for chronic hepatitis B and C among migrant populations in a low endemic country. PLoS ONE 2018;13: e0207037.

31. Ministerio de Sanidad. Guía de cribado de la infección por VHC. Madrid: Ministerio de Sanidad; 2020 https://www.sanidad.gob.es/ciudadanos/enfLesiones/enfTransmisibles/sida/docs/GUIA_DE_CRIBADO_DE_LA_INFECCION_POR_EL_VHC_2020.pdf [Accessed: 25 April 2025]

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

Figure 1. Countries with the highest estimated proportion of immigrants diagnosed of chronic hepatitis B (A) and chronic hepatitis C (B) in Sanitary Area IV of Principado de Asturias.

A. Chronic hepatitis B



B. Chronic hepatitis C

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

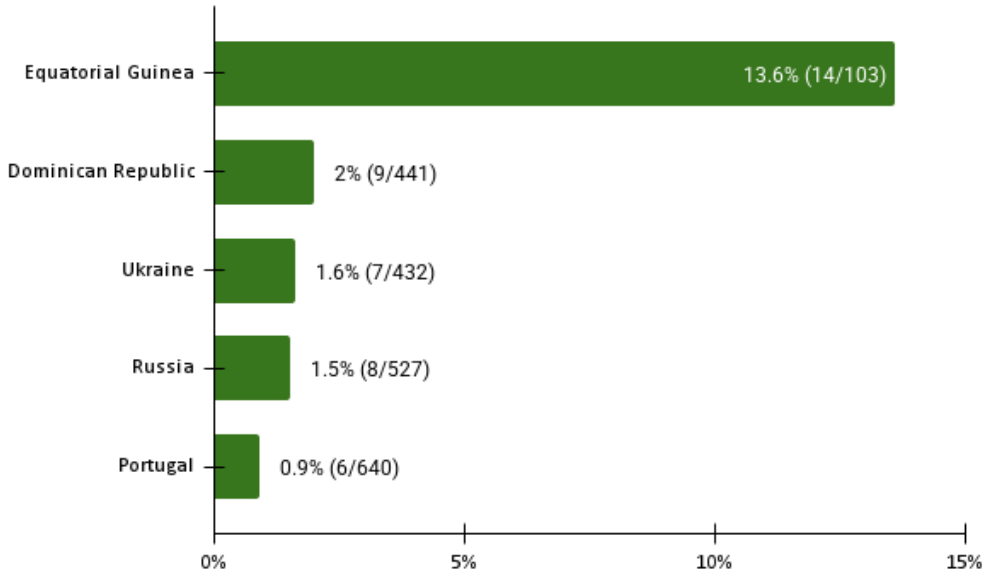


Table 1. Characteristics of immigrants with chronic hepatitis B and comparison between the three geographic areas with the highest number of cases.

*TE: Trasient elastography. kPa: kilopascals. *Determined in 176 (59.9%). † Done in 259 (88.1%)*

Variable	Global (n=294)	Asia[1] (n=43)	Eastern Europe[2] (n= 79)	Sub-Saharan Africa[3] (n= 98)	p
Male sex, n (%)	162 (55.1)	19 (44.2)	32 (40.5)	74 (75.5)	<0.001
Age, median (Q1-Q3)	34 (27-41.2)	32 (24-38)	33 (28-40)	33 (25-38)	<0.001
Acquisition mechanism					
Unknown, n (%)	196 (66.7)	4 (9.3)	61 (77.2)	86 (87.5)	<0.001
Vertical/intrafamilial, n (%)	83 (28.2)	39 (90.7)	14 (17.7)	10 (10.2)	
HBeAg positive, n (%)	45 (15.3)	21 (48.8)	6 (7.6)	6 (6.1)	<0.001
HBV genotype, n (%)*					
A	45 (25.5)	2 (6.4)	18 (38.2)	18 (32.7)	<0.001
B	9 (5.1)	8 (25.8)	0	1 (1.8)	
C	23 (13.1)	21 (67.7)	2 (4.2)	0	
D	53 (30.1)	0	27 (57.4)	5 (9.1)	
E	32 (18.2)	0	0	31 (56.3)	
F	14 (8.0)	0	0	0	
Anti-HDV positive, n (%)	23 (7.8)	0	7 (8.9)	11 (11.2)	0.079
HBV Infection phase					
HBeAg-positive infection	4 (1.4)	4 (9.3)	0	0	<0.001
HBeAg-positive hepatitis	41 (13.9)	17 (39.5)	8 (10.1)	6 (8.1)	

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

Table 2. Characteristics of immigrants with chronic hepatitis C and comparison between the two geographic areas with the highest number of cases.

Variable	Global (n=94)	Eastern Europe (n= 38)	Sub-Saharan Africa (n= 15)	P
Male sex, n (%)	51 (54.3)	18 (47.4)	8 (53.3)	0.69
Age, median (Q1-Q3)	51.6 (39.5-61.7)	42.6 (36.6-53.2)	68,1 (55.5-71.0)	<0.001
Acquisition mechanism				
Unknown, n (%)	42 (44.7)	17 (44.7)	11 (73.3)	
IDU, n (%)	20 (21.3)	12 (31.6)	0	0.029
Transfusion, n (%)	18 (19.1)	7 (18.4)	2 (13.3)	

HCV genotype, n (%)*				
1a	24 (25.5)	2 (5.3)	4 (26.7)	
1b	36 (38.3)	23 (60.5)	1 (6.7)	
2	4 (4.3)	1 (2.6)	1 (6.7)	<0.001
3	17 (18.1)	11 (28.9)	0	
4	7 (7.4)	0	6 (40)	
Others	6 (6.3)	1 (2.6)	3 (20)	
Anti-HBc positive, n (%)	40 (42.6)	15 (39.5)	12 (80.0)	0.008
Anti-HIV positive, n (%)	3 (3.2)	1 (2.6)	1 (6.6)	0.49
Harmful alcohol use, n (%)	15 (16)	9 (23.7)	1 (6.7)	0.24
TE (kPa), median (Q1-Q3)*	7.9 (5.7-12.6)	6.1 (5.1-11.2)	10.4 (7.5-14.7)	0.011
TE > 9 kPa, n (%)	35 (42.7)	13 (34.2)	11 (73.3)	0.015
Cirrhosis, n (%)	24 (25.5)	6 (15.8)	5 (33.3)	0.25
Antiviral treatment, n(%)	87 (92.5)	34 (89.5)	14 (93.3)	1

*IDU: Injecting Drug User. TE: Transient elastography. kPa: kilopascals. *Done in 82 (87.2%)*

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

Table 3. Comparison between immigrants with chronic hepatitis B (CHB) and C (CHC).

Variable	CHB (n=294)	CHC (n=94)	p
Male sex, n (%)	162 (55.1)	51 (54.3)	0.98
Age, median (Q1-Q3)	34 (27-41.2)	51.6 (39.5-61.7)	<0.001
Acquisition mechanism			
Unknown, n (%)	196 (66.7)	42 (44.7)	
Vertical/intrafamiliar transmission, n (%)	83 (28.2)	0	<0.001
IDU, n (%)	0	20 (21.3)	
Transfusion, n (%)	0	18 (19.1)	
Harmful alcohol use, n (%)	11 (3.7)	15 (16)	<0.001

Revista Española de Enfermedades Digestivas
The Spanish Journal of Gastroenterology

Diabetes, n (%)	17 (5.8)	9 (9.6)	0.29
BMI, median (Q1-Q3)	24.5 (21.7-27.6)	26.7 (23.2-29.6)	0.003
Anti-HIV positive, n (%)	6 (2)	3 (3.2)	0.45
TE (kPa), median (Q1-Q3)	5.2 (4.4-6.4)*	7.9 (5.7-12.6)†	0.003
TE > 9 kPa, n (%)	27/259 (10.4)	35/82 (42.7)	<0.001
Cirrhosis, n (%)	24 (8.2)	24 (25.5)	<0.001
Antiviral treatment, n (%)	96 (32.7)	87 (92.5)	<0.001

*IDU: Injecting Drug User. BMI: Body Mass Index TE: Transient elastography. kPa: kilopascals.*Done in 259. †Done in 82.*