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Comparison of Characteristics and Outcomes of Hepatitis B and Hepatitis C Patients in the Fars Hepatitis Registry

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Abstract

Background: Hepatitis, which refers to liver inflammation, can have various causes, with viral hepatitis being the most common.

Objectives: This study aimed to compare demographic and laboratory variables, risk factors, and outcomes between Hepatitis B (HBV) and Hepatitis C (HCV) patients in the Fars hepatitis registry.

Methods: In this cross-sectional study, a total of 6,690 eligible patients, consisting of 3,840 (57.4%) with HBV and 2,820 (42.6%) with HCV, were assessed from the database covering the period from 1995 to 2023. Comparisons between HBV and HCV were made using the Chi-square test, Fisher's exact test, or independent sample *t*-test with SPSS software.

Results: The average age of the patients was 52.56 years (standard deviation: 13.24). Significant differences were found between HBV and HCV patients regarding sex, marital status, education level, family history of HBV and HCV, smoking status, drug use, and body mass index ($P < 0.001$ for all). Hepatitis B patients had a higher prevalence of dental procedures ($P < 0.001$) and uncertain sexual contacts ($P = 0.009$), while blood transfusion, intravenous drug use, major thalassemia ($P < 0.001$ for all), tattoos ($P = 0.004$), and hemodialysis ($P = 0.001$) were more common in HCV patients. Hepatitis C patients showed higher levels of liver enzymes ($P < 0.001$) and total bilirubin ($P = 0.002$) but lower levels of albumin ($P < 0.001$) and prothrombin time ($P = 0.034$) compared to HBV patients. Cirrhosis was also more common in HCV patients ($P < 0.001$).

Conclusions: Our findings highlight different patterns of demographic factors, risk factors, and outcomes between HBV and HCV patients, which could influence their prevention and management strategies.

Keywords: Hepatitis B Virus, Hepatitis C Virus, Registries, Risk Factors

1. Background

Hepatitis, primarily caused by Hepatitis B (HBV) and Hepatitis C (HCV) viruses, affects millions of people worldwide and represents a significant health burden (1). Persistent HBV and HCV infections can lead to serious liver conditions such as cirrhosis, liver failure, and hepatocellular carcinoma (HCC) (2). According to estimates from the World Health Organization (WHO), 71 million people globally have chronic HCV infection, while 296 million people are living with chronic HBV infection (3).

Iran, with a population of over 80 million, has implemented several programs aimed at reducing the incidence of viral hepatitis (4). These initiatives include nationwide HBV vaccination campaigns and harm reduction strategies to curb the spread of HCV among people who inject drugs (PWID) (5). Despite these efforts, viral hepatitis remains a public health issue in Iran, underscoring the importance of understanding regional epidemiology to develop effective prevention and control programs tailored to specific areas. Studies show that the prevalence and risk factors of HBV and HCV infection vary across different regions of Iran (6), highlighting the need for localized data to guide public health interventions.

With a population of over 4 million (7), Fars province in southern Iran provides a significant case study for

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examining regional hepatitis epidemiology. Although numerous investigations have explored the incidence of HBV and HCV in Iran (8), a comprehensive analysis based on data from a large, dedicated registry has been lacking. This study aims to address that gap by analyzing data from the Fars hepatitis registry to assess the prevalence, demographics, and risk factors associated with HBV and HCV infections.

2. Objectives

Our objective is to offer new insights into the current hepatitis epidemiology in southern Iran, with the ultimate goal of reducing the burden of hepatitis through informed, targeted interventions.

3. Methods

3.1. Methods

In this cross-sectional descriptive-analytical study, we included a total of 6,690 adult patients with enzyme immunoassay-confirmed HBV and HCV infections, with a minimum of six months having elapsed since their diagnosis, from the Fars hepatitis registry. Patients with other known hepatic diseases, malignancies, co-infections of HBV and HCV, acute hepatitis, or severe comorbid conditions (e.g., heart failure, chronic kidney disease) were excluded from the study. The study protocol was thoroughly evaluated and approved by the Ethics Committee of Shiraz University of Medical Sciences, with the code IR.SUMS.REC.1396.S440.

The Fars hepatitis registry is affiliated with Shiraz University of Medical Sciences, based at the Gastroenterohepatology Research Center within the Motahhari Referral Clinic in Shiraz, Iran. All eligible subjects were referred to the clinic by gastroenterologists. Data collection commenced in 1995 and continued until 2023, with the first patient included in the records having been diagnosed in 1991. Before the patients' admission to this facility, the goals of the study were explained to them, and informed consent was obtained from each participant. Subsequently, data regarding the timing of diagnosis, demographic characteristics, medical history, disease progression (including symptoms at onset), laboratory results, history of exposure to potential transmission routes and risk factors, and family history of hepatitis infection were collected, and anthropometric measurements were taken. The enrolled patients were followed up every six months through telephone interviews and in-person visits conducted by gastroenterologists. The aim of this study was to evaluate the course of the disease and its associated outcomes, including cirrhosis, hepatocellular carcinoma, liver transplantation, and mortality.

3.2. Statistical Analysis

The descriptive analysis presented the available data as the (mean ± standard deviation) for numerical variables and as frequencies and percentages for categorical variables. The association between each pair of categorical variables was assessed using either the chi-square test or Fisher's exact test. The relationship between categorical and quantitative variables was examined using an independent sample *t*-test. Statistical analyses were performed using SPSS software, version 25 (SPSS Inc., Chicago, IL). A P-value of less than 0.05 was considered statistically significant.

4. Results

Our database includes records of 6,690 adult patients with hepatitis, comprising 3,840 (57.4%) HBV and 2,820 (42.6%) HCV patients. Among these patients, 78.5% were male, with a mean age of 52.56 years (SD: 13.24). According to Table 1, male sex was more prevalent in HCV patients compared to HBV patients (88.1% vs. 66.6%, P-value < 0.001). Additionally, significant differences were observed between HBV and HCV patients in terms of marital status, education level, and family history of HBV and HCV (P-value < 0.001 for all variables). Body Mass Index was significantly higher in HBV patients compared to HCV patients (P-value < 0.001).

Table 2 also demonstrates significant differences in smoking status and drug usage between HBV and HCV patients (P-value <0.001).

We identified dental procedures (68.9%), blood transfusion (14.5%), tattoos (2.1%), and war injuries (1.0%) as the most prevalent risk factors among the registered patients, respectively (Table 3).

Upon comparing the frequency of potential risk factors between HBV and HCV patients, we observed that the prevalence of dental procedures (71.5% vs. 65.4%, P-value < 0.001) and uncertain sexual contacts (0.7% vs. 0.2%, P-value = 0.009) were significantly higher in HBV patients compared to those with HCV. Conversely, blood transfusion (23.7% vs. 7.6%, P-value < 0.001), tattoos (2.7% vs. 1.7%, P-value = 0.004), hemodialysis (1.1% vs. 0.4%, P-value = 0.001), intravenous drug injection (1.8% vs. 0.1%, P-value < 0.001), and major thalassemia (0.5% vs. 0.0%, P-value < 0.001) were more common in patients with HCV compared to those with HBV.

Table 1. Comparison of Demographic Characteristics Among Registered Patients with Hepatitis [a]

Basic Characteristics	Total	HBV	HCV	P-Value
Total	6690	3840 (57.4)	2850 (42.6)	
Gender				< 0.001 [b, c]
Male	5068 (75.8)	2556 (66.6)	2512 (88.1)	
Female	1622 (24.2)	1284 (33.4)	338 (11.9)	
Marital status				< 0.001 [b, c]
Single	1448 (21.6)	617 (16.1)	831 (29.2)	
Married	4979 (74.4)	3132 (81.6)	1847 (64.8)	
Separated/divorced	170 (2.5)	40 (1.0)	130 (4.6)	
Widowed	93 (1.4)	51 (1.3)	42 (1.5)	
Education				< 0.001 [b, c]
Illiterate	885 (13.2)	679 (19.5)	206 (7.7)	
Elementary school	2564 (38.3)	1372 (39.5)	1192 (44.8)	
High school	853 (12.8)	404 (11.6)	449 (16.9)	
Diploma	1337 (20.0)	690 (19.9)	647 (24.3)	
College	497 (7.4)	329 (9.5)	168 (6.3)	
Family history of HBV	1267 (18.9)	1220 (31.8)	47 (1.6)	< 0.001 [b, c]
Family history of HCV	199 (3.0)	37 (1.0)	162 (5.7)	< 0.001 [b, c]
BMI (kg/m ^{2})	24.80 ± 4.49	25.32 ± 4.51	24.12 ± 4.38	< 0.001 [c, d]
Age (y)	52.56 ± 13.24	52.75 ± 14.28	52.31 ± 11.68	0.169 [d]

Abbreviations: BMI, Body Mass Index; HBV, Hepatitis B virus; HCV, Hepatitis C virus; SD, standard deviation.

[a] Values are expressed as No. (%) or mean ± SD.

[b] Between-group differences were determined using chi-square test for qualitative.

[c] $P < 0.05$ was considered statistically significant.

[d] Between-group differences were determined using Independent sample *t*-test for qualitative data.

Table 2. Comparison of Smoking and Drug use Among Registered Patients with Hepatitis [a, b, c]

Basic characteristics	Total	HBV	HCV	P-Value [d]
Smoking				< 0.001
No	4483 (67.0)	3252 (72.5)	1231 (27.5)	
Current smoker	1429 (21.4)	307 (21.5)	1122 (78.5)	
Ex-smoker	778 (11.6)	281 (36.1)	497 (63.9)	
Water pipe				< 0.001
No	5806 (86.8)	3418 (58.9)	2388 (41.1)	
Current smoker	382 (5.7)	201 (52.6)	181 (47.4)	
Ex-smoker	502 (7.5)	221 (44.0)	281 (56.0)	
Chemical drugs	54 (0.8)	5 (0.1)	49 (1.7)	< 0.001
Traditional drugs	99 (1.5)	24 (0.6)	75 (2.6)	< 0.001

Abbreviations: HBV, Hepatitis B virus; HCV, Hepatitis C virus.

[a] Values are expressed as No. (%).

[b] Between-group differences were determined using chi-square test.

[c] Chemical drugs included crack, crystal, methadone, and tamjizak, and traditional drugs included opium, burned opium, heroin, hashish, grass, marijuana, snus, and shire.

[d] $P < 0.05$ was considered statistically significant.

According to Table 4, patients with HCV exhibited significantly higher levels of aspartate transaminase (P-value < 0.001), alanine transaminase (P-value <0.001), alkaline phosphatase (P-value < 0.001), and total

Table 3. Comparison of Risk Factors Among Hepatitis B Virus and Hepatitis C Virus Patients [a, b]

Risk Factors	Total	HBV	HCV	P-Value
Dental procedures	4607 (68.9)	2744 (71.5)	1863 (65.4)	< 0.001 [c]
Blood transfusion	968 (14.5)	293 (7.6)	675 (23.7)	< 0.001 [c]
Tattoo	143 (2.1)	65 (1.7)	78 (2.7)	0.004 [c]
War injuries	67 (1.0)	44 (1.1)	23 (0.8)	0.169
Hemodialysis	49 (0.7)	17 (0.4)	32 (1.1)	0.001
Intravenous drug injection	55 (0.8)	5 (0.1)	50 (1.8)	< 0.001 [c]
Sharp trauma	44 (0.7)	25 (0.7)	19 (0.7)	0.938
Prison	19 (0.3)	7 (0.2)	12 (0.4)	0.070
Uncertain sexual contacts	31 (0.5)	25 (0.7)	6 (0.2)	0.009
Major thalassemia	14 (0.2)	1 (0.0)	13 (0.5)	< 0.001 [c]
Cupping	17 (0.3)	10 (0.3)	7 (0.2)	0.905
Surgery	2 (0.0)	2 (0.1)	0 (0.0)	0.223

Abbreviations: HBV: Hepatitis B virus; HCV: Hepatitis C virus.

[a] Values are expressed as No. (%).

[b] Between-group differences were determined using chi-square test.

[c] $P < 0.05$ was considered statistically significant.

Table 4. Comparison of Laboratory Data Among Hepatitis B Virus and Hepatitis C Virus Patients [a]

Variables	Total	HBV	HCV	P-Value
Hemoglobin (g/dL)	14.62 ± 2.14	14.60 ± 1.94	14.65 ± 2.35	0.423 [b]
Protein (g/dL)	7.60 ± 0.81	7.60 ± 0.77	7.60 ± 0.86	0.954 [b]
Albumin (g/dL)	4.38 ± 0.59	4.44 ± 0.57	4.31 ± 0.60	< 0.001 [b, c]
AST (IU/L)	33.00 (23.00 - 57.00)	27.00 (21.00 - 39.00)	47.00 (30.00 - 79.00)	< 0.001 [c, d]
ALT (IU/L)	40.00 (23.00 - 74.00)	30.00 (20.00 - 53.00)	58.00 (33.00 - 99.00)	< 0.001 [c, d]
ALP (IU/L)	202.00 (156.00 - 260.75)	194.00 (148.00 - 251.00)	213.00 (167.00 - 273.00)	< 0.001 [c, d]
Total bilirubin (mg/dL)	0.80 (0.60 - 1.20)	0.80 (0.60 - 1.20)	0.90 (0.60 - 1.26)	0.002 [c, d]
BUN (mg/dL)	13.00 (11.00 - 17.00)	13.00 (11.00 - 17.00)	13.00 (11.00 - 16.30)	0.709 [d]
INR	1.05 (1.00 - 1.20)	1.05 (1.00 - 1.20)	1.05 (1.00 - 1.20)	0.589 [d]
PT	13.28 ± 1.54	13.29 ± 1.51	13.26 ± 1.58	0.034 [b, c]
TSH (mIU/L)	1.87 (1.08 - 2.80)	1.79 (1.10 - 2.57)	1.94 (1.06 - 3.00)	0.104 [d]

Abbreviations: ALP, alkaline phosphatase; ALT, alanine transaminase; AST, aspartate transaminase; BUN, blood urea nitrogen; HBV, Hepatitis B virus; HCV, Hepatitis C virus; INR, international normalized ratio; IQR, interquartile rage; PT, prothrombin time; SD, standard deviation.

[a] Values are expressed as mean ± SD or median (IQR).

[b] Between-group differences were determined using independent sample *t*-test.

[c] $P < 0.05$ was considered statistically significant.

[d] Between-group differences were determined using Mann-Whitney U test.

bilirubin (P-value = 0.002), but lower levels of albumin (P-value < 0.001) and prothrombin time (P-value = 0.034) compared to HBV patients.

A comparison of the outcomes among registered patients revealed 452 (6.8%) cases of cirrhosis, 4 (0.1%) cases of liver transplantation, 1 (0.0%) case of hepatocellular carcinoma, and 20 (0.3%) deaths. The majority of patients with cirrhosis were male (87.4% vs. 15.3%, P-value < 0.001), while no significant differences were observed between males and females for other outcomes (P-value > 0.999 for liver transplantation and hepatocellular carcinoma, and P-value = 0.798 for death, see Table 5). Cirrhosis was significantly more prevalent among HCV patients (66.2% vs. 33.8%, P-value < 0.001).

Table 5. Comparison of the Outcomes Among Hepatitis B Virus and Hepatitis C Virus Patients [a]

Outcomes	Total	HBV	HCV	P-Value
Cirrhosis	452 (6.8)	153 (33.8)	299 (66.2)	< 0.001 [b, c]
Liver transplantation	4 (0.1)	3 (75.0)	1 (25.0)	0.641 [d]
Hepatocellular carcinoma	1 (0.0)	0 (0.0)	1 (100.0)	0.426 [d]
Death	20 (0.3)	13 (65.0)	7 (35.0)	0.491 [b]

Abbreviations: HBV, Hepatitis B virus; HCV, Hepatitis C virus.

[a] Values are expressed as No. (%).

[b] Between-group differences were determined using Chi-square

[c] $P < 0.05$ was considered statistically significant.

[d] Between-group differences were determined using Fisher Exact tests.

5. Discussion

The study provides important insights into the epidemiology of hepatitis, specifically analyzing the prevalence, risk factors, clinical features, and outcomes among adult patients in southern Iran. The findings reveal notable differences between HBV and HCV, highlighting the need for tailored prevention and treatment strategies. Our research identified a higher proportion of HCV patients being male compared to HBV patients, suggesting the need for further investigation into potential sex-specific risk factors or healthcare-seeking behaviors (9). The literature presents conflicting evidence regarding sex differences in hepatitis prevalence. While some studies suggest that HCV is more prevalent and progresses more rapidly in men, potentially linked to higher rates of intravenous drug use, others have reported contradictory findings (10, 11).

The mean age of patients in our study was 52.56 years, indicating that hepatitis infections disproportionately affect older individuals in this region (12). This underscores the importance of targeted screening and immunization efforts in older age groups to mitigate the impact of viral hepatitis-related complications (13).

5.1. Risk Factors

Our analysis identified various risk factors associated with hepatitis transmission, including dental procedures, blood transfusion, tattooing, and war injuries. Notably, dental procedures emerged as the most prevalent risk factor among registered patients, emphasizing the importance of infection control measures in dental settings to prevent disease transmission (14). Additionally, significant disparities were reported between HBV and HCV patients in terms of the incidence of specific risk factors. In line with our findings, a substantial correlation was observed between dental procedures and sexual risk behaviors with HBV in Morocco (15). Another study found that multiple heterosexual partnerships, longer periods of imprisonment, body tattoos, and the sharing of sharp objects in prison were risk factors associated with HBV. Moreover, the presence of body tattoos, a prior history of surgery, and imprisonment were linked to HCV infection (16). Hepatitis B virus patients exhibited a higher prevalence of dental procedures, while HCV patients were more commonly associated with blood transfusions, tattooing, and intravenous drug injection (17). These findings underscore the diverse transmission routes for HBV and HCV and highlight the importance of targeted prevention efforts tailored to specific risk profiles (3).

5.2. Clinical Characteristics and Outcomes

In terms of clinical parameters, HCV patients exhibited significantly higher levels of liver enzymes compared to HBV patients (18). This finding reflects the distinct pathophysiological mechanisms underlying HBV and HCV infections, with HCV often resulting in more severe liver damage and elevated hepatic biomarkers (19). Additionally, our study revealed a higher prevalence of cirrhosis among HCV patients compared to HBV patients, highlighting the chronic and progressive nature of HCV infection (20). Given the significant burden of cirrhosis on healthcare resources and patient outcomes, enhancing HCV screening, early diagnosis, and access to antiviral therapy is critical for reducing cirrhosis-related complications and mortality (21).

5.3. Limitations and Future Directions

It is important to acknowledge several limitations in our study. First, the study design may introduce biases related to data collection and patient selection. Additionally, the reliance on electronic health records could have led to incomplete or inaccurate documentation of certain variables. Future studies using prospective methodologies and more comprehensive data collection protocols are needed to validate our findings and further clarify the underlying mechanisms of hepatitis transmission and disease progression in this population.

5.4. Conclusions

Our study provides a comprehensive analysis of the epidemiology of hepatitis in southern Iran, highlighting significant differences in demographic, clinical, and risk factor characteristics between HBV and HCV infections. These findings have important implications for public health initiatives, including targeted screening, vaccination, and harm reduction strategies, aimed at reducing the burden of viral hepatitis and its associated complications in this region.

Footnotes

Authors' Contribution: Conceptualization: A. R. S., G. R. S., and M. R. F.; methodology: A. R. S., G. R. S., M. R. F., L. A., L. R., Y. N., S. A., and S. S. Z.; data curation, formal analysis, and software: S. S. Z. and A. R. S.; project administration, validation, and supervision: A. R. S.; funding acquisition: M. R. F.; writing original draft: A. R. S. and S. S. Z.; writing review and editing: A. R. S., G. R. S., M. R. F., L. A., L. R., S. A, Y. N., and S. S. Z. All authors have read and approved the manuscript.

Conflict of Interests Statement: The authors declare that they have no competing interests.

Data Availability: Data supporting the results of this study is available from the corresponding author, upon reasonable request.

Ethical Approval: This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Shiraz University of Medical Sciences, Shiraz, Iran (code: IR.SUMS.REC.1396.S440).

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Informed Consent: All the data were anonymized before the processing, and participants gave written informed consent for sharing their data.

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