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Seroprevalence and Coinfection of Hepatitis B and Hepatitis C Viruses in Western Uttar Pradesh: A Tertiary Care Hospital-Based Study

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ABSTRACT

Background: Hepatitis B virus (HBV) and hepatitis C virus (HCV) remain important causes of chronic liver disease (CLD) in India, sharing similar transmission routes and hepatotropic. HBV and HCV coinfection can lead to serious liver complications and an increased risk of hepatocellular carcinoma (HCC). Most individuals infected with these viruses remain asymptomatic until the advanced stages of the disease, contributing to underdiagnosis and ongoing viral transmission. This study aimed to assess the seroprevalence of HBV, HCV, and their coinfection among patients seeking care at a tertiary hospital in Western Uttar Pradesh.
Methods: A cross-sectional retrospective study was done at a tertiary care academic health organization of North India from January 2022 to June 2025. A total of 73018 patients who were screened for HBV and HCV using rapid immunochromatography tests, followed by confirmation with a chemiluminescent immunoassay (CMIA). Statistical analysis was performed using the Chi-square test; $P < 0.05$ was considered significant.
Results: The seroprevalence of HBV and HCV was 2.58% and 3%, respectively, while HBV–HCV coinfection was observed in 0.11% of patients. Infection rates were higher in males than females (HBV: 71.8% vs. 28.2%; HCV: 60.5% vs. 35.5%). The highest prevalence was observed in the 26–35-year age group. The highest positivity was seen in patients in the Medicine and ART clinics.
Conclusion: This study indicates a moderate burden of HBV and HCV infection in Western Uttar Pradesh, corresponding to India's intermediate endemicity zone. The high prevalence in young adults highlights the need for awareness, vaccination, and routine screening to prevent chronic complications and transmission.

Keywords: HBV; HCV; coinfection; seroprevalence

INTRODUCTION

Viral hepatitis, especially hepatitis B (HBV) and hepatitis C (HCV), constitutes a serious public health challenges in India, substantially contributing to chronic liver disease, cirrhosis, and hepatocellular carcinoma.[1,2] The WHO Global Hepatitis Report 2024 estimates that in India, 29 million people live with HBV and 5.5 million with HCV, making it among those with the highest global burdens.[3] Approximately 50% of infections occur in

adults aged 30–54 years, while 12% occur in children, stressing the need to prioritize pediatric and adolescent testing and treatment. Coinfection with HBV and HCV is of major concern due to additive hepatic injury and an accelerated progression toward cirrhosis and HCC.[4,5]

According to National Viral Hepatitis Control Program (NVHCP) data, the overall population prevalence of hepatitis B virus (HBV) in India is 0.95 per cent (confidence range 0.89-1.01%), while for hepatitis C virus (HCV), the prevalence is 0.32 per cent (confidence range 0.28-0.36).[6]

However, data specific to different regions remains limited. Western Uttar Pradesh, characterised by dense population and diverse health service accessibility, lacks large-scale data on HBV and HCV prevalence. Therefore, this study was undertaken to assess the seroprevalence and coinfection rates of HBV and HCV in a hospital-based population at GIMS, Greater Noida.

MATERIALS & METHODS

This cross-sectional retrospective study was conducted from January 2022 to June 2025. At this Institute we have a NABL accredited medical lab (ISO 15189) and frequently participate in various External Quality Assessment Schemes. Patients who underwent HBV and HCV screening prior to invasive or surgical procedures, or who presented with symptoms indicative of acute or chronic liver disease, were included. Recruitment occurred in both outpatient and inpatient departments.

Blood samples were collected from patients of all age groups and genders. Exclusion criteria comprised haemolysed specimens, incomplete data, and insufficient sample volume. Approximately 5 mL of venous blood was collected in plain vials and transported to the laboratory for analysis.

HBV and HCV testing were performed using a commercially available chemiluminescent immunoassay analyzer, ARCHITECT *i*1000SR (Abbott Laboratories, TX, USA), for HBsAg and HCV. HBsAg positive samples were confirmed with HBsAg confirmatory test by chemiluminescent immunoassay analyzer and for HCV chemiluminescent immunoassay analyzer was performed in duplicate as per manufacture's instructions.

Statistical Analysis

The prevalence of HBV and HCV infection was expressed as percentages. Statistical analysis of the study findings for HBV and HCV employed the Chi-square test (χ^2) with Yates' correction. A P value less than 0.05 was considered statistically significant.

RESULT

Of the 73,018 samples tested, 1,877 (2.58%) were positive for HBsAg, 2,207 (3%) for anti-HCV antibodies, and 81 (0.11%) demonstrated coinfection. Table 1 shows males exhibited significantly higher positivity rates across all categories (P < 0.001).

Table 1: Gender wise distribution of HBV and HCV cases

Infection Type	Gender	Total Cases (n, %)	Positive Cases (n, %)	P Value
HBV	Male	39,430 (54%)	1,348 (71.8%)	<0.0001
	Female	33,588 (46%)	529 (28.2%)	
	Total	73,018	1,877 (2.58%)	
HCV	Male	22,833 (62%)	1445 (65.5%)	<0.0001
	Female	13,995 (38%)	762 (35.5%)	
	Total	73,018	2,207 (3%)	
Coinfection	Male		66 (82%)	<0.0001
	Female		15 (18%)	
	Total		81 (0.11%)	

HBV positivity ranged from 2.20% to 2.9%, and HCV from 2.7% to 3.3%. Table 2 shows year wise distribution of HBV cases with slightly increasing percentage from

2022 to 2025 which was statistically significant (p=0.002), however during 2024 and 2025 it was not significant. (p=0.26). Similar trend was seen in HCV with p value of 0.003, however for 2024-25 was not statistically significant (p=0.61).

Table 2: Year-wise distribution of total HBV and HCV cases

Year	HBV Positive	HBV Negative	HBV Total	HBV Percentage	HCV Positive	HCV Negative	HCV Total	HCV Percentage
2022	344	15281	15625	2.20%	422	15203	15625	2.70%
2023	536	20892	21428	2.50%	621	20807	21428	2.90%
2024	627	22588	23215	2.70%	743	22472	23215	3.20%
2025[±]	370	12380	12750	2.90%	421	12329	12750	3.30%
Total	1877	71141	73018		2207	70811	73018	
	2.58%	97.42%	100%		3%	97%	100%	

[±]2025 data is from Jan to June 2025

Figure 1 shows the highest infection rates were observed among individuals aged 26–35 years (HBV: 24%; HCV: 29%), followed by those aged 36–45 years. Lower prevalence in children under 16 and adults over 65 likely reflects the impact of vaccination and changing risk profiles.

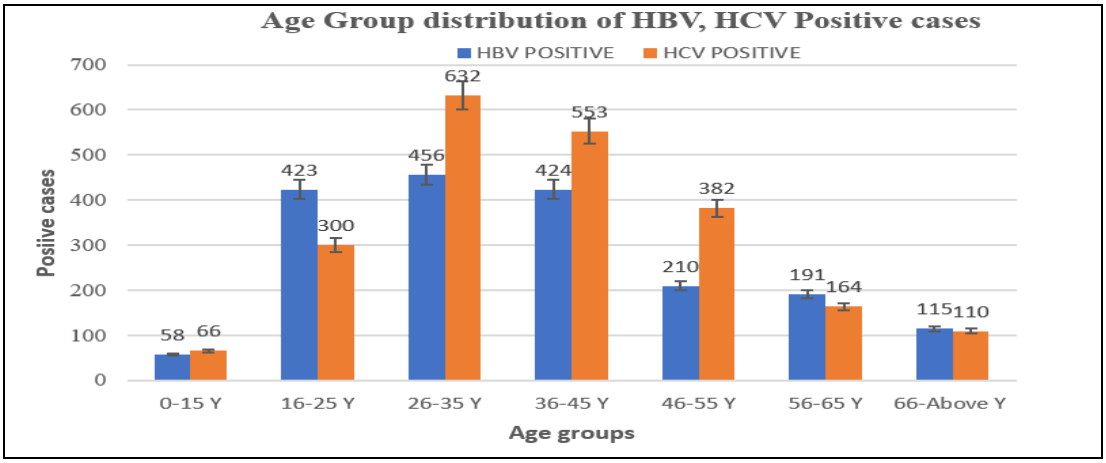

Figure 1: HBV and HCV positivity in various age groups.

DISCUSSION

The observed HBV prevalence of 2.58% in this study is consistent with reports from other regions of India (0.95%), supporting India's classification as an intermediate-endemic area.[7,8] HCV seroprevalence of 3% aligns with national averages and indicates ongoing transmission risks in both hospital and community settings.[9,10] However the present study is based on hospital-based study limiting its generalizability. Year wise distribution of HBV and HCV cases with slightly increasing percentage from 2022 to 2025 which was statistically significant (p=0.002), however during 2024 and 2025 it was not significant. (p=0.26). Similar trend was seen in HCV with p value of 0.003, however for 2024-25 was not statistically significant (p-0.61). As per a 2024 report of Global Hepatitis Report, around 29.8 million individuals in India were estimated to be living with HBV infection in 2022.[11] In India, weighted anti-HCV seroprevalence in low-risk population is close to 0.49%, and the burden is estimated to be around 5 million.[12]

The predominance of male cases likely reflects gender-associated behavioural and occupational exposure risks. The concentration of infections in the 26–35-year age group brings attention to the requirement for focused awareness initiatives among young adults, notably about safe medical practices and vaccination

coverage.[13,5] Increased vaccination coverage among children, which reached 83.9% in National Family Health Survey (NFHS-5) (2019-2021), is a significant factor in reducing the disease burden in younger populations.[14]

Although this study is hospital-based, the data present important information about the disease burden in Western Uttar Pradesh and might inform regional implementation of the National Viral Hepatitis Control Program.[15,16]

This study has several limitations due to its retrospective design. Reliance on existing records limited the availability of comprehensive sociodemographic data and detailed clinical laboratory parameters for individuals testing positive for HBV and HCV. Additionally, as the study population was drawn from a single tertiary care hospital, the findings may not fully represent epidemiological patterns in the wider Western Uttar Pradesh region. To improve validity and broader relevance, subsequent studies should employ prospective study designs with systematic data collection and population-based sampling. Such approaches would facilitate a more accurate characterization of the epidemiology and disease burden of HBV and HCV infections in this region.

CONCLUSION

This study provides baseline data on HBV and HCV prevalence in Western Uttar Pradesh. The moderate seroprevalence and notable coinfection rates highlight the importance of strengthened public health measures, including enhanced vaccination and public awareness initiatives, routine screening among high-risk groups, and the integration of viral hepatitis services into primary healthcare. Early diagnosis and treatment are essential for achieving the WHO goal of hepatitis elimination by 2030.

Declaration by Authors

Ethical Approval: Approved

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