

Original Research Article

TO STUDY THE SEROPREVALENCE OF VIRAL MARKERS (HCV, HBV AND HIV) ALONG WITH THEIR CO-INFECTIONS IN THE POPULATION ATTENDING ONE OF THE TERTIARY CARE HOSPITAL IN MALWA REGION OF PUNJAB OVER FIVE YEARS

Bhavana Yadav¹, Maninder Kaur², Neetika Kalra¹

¹Assistant Professor, Department of Microbiology, Gian Sagar Medical College and Hospital, Rajpura, Patiala, Punjab, India

²Professor & HOD, Department of Microbiology, Gian Sagar Medical College and Hospital, Rajpura, Patiala, Punjab, India

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Corresponding Author:

Dr. Bhavana Yadav,
Assistant Professor, Department of
Microbiology, Gian Sagar Medical
College and Hospital, Rajpura, Patiala,
Punjab, India.
Email: dr.bhavanayadav@gmail.com

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ABSTRACT

Background: In India, screening for anti-HIV antibody for HIV, HBsAg (Hepatitis B surface antigen) for HBV, and anti-HCV antibody for Hepatitis C virus is a common practice, often combined as a viral marker testing. Analysing the seroprevalence of HIV, HBV and HCV provides valuable insights into the prevalence and distribution of these viral infections in a population, enabling targeted prevention and treatment strategies. The present retrospective study aimed to analyse the seroprevalence of blood-borne viral infections among patients presenting to a tertiary care hospital in Punjab between 2020 and 2024. **Materials and Methods:** Blood samples received in the microbiology laboratory were tested for HBsAg, anti-HCV antibodies and anti-HIV-1 and HIV-2 antibodies using rapid diagnostic kits, and results were confirmed by ELISA as per the manufacturer's specifications. Demographic profile of the patients was obtained from the microbiology log register.

Results: Over a 5-year period, 8,047 individuals were screened for HIV, of whom 30 tested positive, yielding a prevalence of 0.4%. A total of 7,816 individuals were screened for hepatitis B virus (HBV), with 60 came out positive (0.8%). For hepatitis C virus (HCV), 7,936 individuals were screened, and 239 were positive, indicating a prevalence of 3.01%. Gender-based distribution showed male predominance across all viral markers, with HBV (51.7%), HIV (66.7%), and HCV (61.5%). Age stratification indicated that most HIV (40%), HBV (58.3%) and HCV (70.3%) cases occurred in individuals older than 40 years.

Conclusion: Given their propensity to induce chronic illness, viral pathogens such as HIV, HBV, and HCV need to be closely monitored. To stop these diseases from spreading further throughout the population, seropositive patients should be discovered as soon as feasible. Ongoing surveillance and follow-up research are essential to monitor temporal trends in regional data.

Keywords: HBV, HCV, HIV, Seroprevalence, Infection.

INTRODUCTION

The presence of blood-borne viruses, namely hepatitis C virus (HCV), hepatitis B virus (HBV), and human immuno-deficiency virus (HIV), can have a considerable impact on morbidity and pose significant challenges to global health. HIV is a persistent viral condition that, if untreated, invariably

evolves into a devastating condition known as acquired immunodeficiency syndrome (AIDS). The increasing incidence of HIV is a significant global public health concern. HIV is a major contributor of illness and mortality across the globe. An estimated 40.8 million individuals worldwide are living with HIV infection, with around two-third of this number (26.3 million) living in the African region that is

responsible for 50% of all new HIV infections worldwide.^[1] In 2024, 6.3 lakh people died from HIV-related conditions across the world. An estimated 1.4 million children (<15 years) and 39.4 million adults (>15 years) were surviving with HIV in 2024.^[1] In India, 2.6 million people are living with HIV (PLHIV) with a prevalence rate of 0.2% among adults.^[2] In India, risk prone behaviours such as unsafe injectable drug abuse, unprotected sexual activity are the root cause of HIV infection.^[3]

Hepatitis B virus infection primarily involves the liver and may manifest as either acute or chronic disease. HBV is among the foremost causes of chronic hepatitis and liver cirrhosis, followed by hepatocellular carcinoma (HCC). The World Health Organization (WHO) stated that in 2022, nearly 254 million individuals were affected by chronic HBV infection, with 1.5 million new cases occurring every year.^[4] In 2022, India accounted for approximately 29.8 million individuals living with hepatitis B infection.^[4] Around 87% people with chronic HBV infection remain undiagnosed in several countries, and even when hepatitis is diagnosed, only 3% people had received antiviral therapy.^[5] In India, a meta-analysis estimates HBV-HIV co-infection rates ranging between 0.2% and 0.8%.^[6] WHO seeks to end Hepatitis B as a worldwide health challenge by 2030. In May 2016, the World Health Assembly approved the inaugural Global Health Sector Strategy, setting targets to reduce new infections by 90% and mortality by 65% by 2030.^[6]

The global burden for hepatitis C virus (HCV) illness is 50 million.^[4] Notwithstanding its low incidence in the general population, HCV constitutes significant public health concern in India owing to its large population size. India bears significant portion of the worldwide HCV burden. In comparison to numerous nations in Southeast Asia (e.g., Sri Lanka, 0.23%; DPR Korea, 0.34%; Bhutan, 0.47%; Nepal, 0.38%; Maldives, 0.41%; South East Asia Region, 0.84%), the general population of India exhibits a higher HCV seroprevalence ranging from 0.4% to 1.0%.^[7-9] Therefore, around 5.5 million people are seropositive for HCV at any given time, and if treatment is not received promptly and correctly, approximately 1.5 millions of these patients may acquire chronic liver diseases (cirrhosis and HCC) during the next 20 to 30 years.^[10,11] According to the WHO Global Hepatitis Report 2017, India accounts for approximately 11–12% of the global load of viral hepatitis.^[12]

Analysing the seroprevalence of HIV, HBV and HCV provides valuable insights into the prevalence and distribution of these viral infections in a population, enabling targeted prevention and treatment strategies. This information assists in identifying high-risk populations and tracking changes in disease patterns over time, and helps in the implementation of public health policies in the Malwa region of Punjab. Therefore, the present study was conducted to determine the seroprevalence of

HIV, HBV and HCV among patients attending our hospital between January 2020 and December 2024.

MATERIALS AND METHODS

The present study was retrospective and observational. This study aimed to assess the prevalence and temporal trends of blood borne pathogens; namely HBV, HCV, and HIV in general population attending a tertiary care centre in Malwa region of Punjab between 2020 and 2024. All laboratory records of samples received in the microbiology laboratory were reviewed and analyzed. After ensuring data completeness, socio-demographic variables (age and gender) along with serological test results were analyzed. The blood specimens received in microbiology laboratory were centrifuged and serum was used for testing. Serological testing for HBsAg (Hepatitis B surface antigen), anti-HCV antibodies, and anti-HIV antibodies was carried out using commercially available rapid test kits (J. Mitra), with reactive samples subsequently confirmed by enzyme-linked immunosorbent assay (ELISA) using the J. Mitra Microlisa kit. All the investigations were conducted as per standard laboratory guidelines and protocols.

RESULTS

HCV seroprevalence: Over the duration of 5 years, total 7936 cases were tested for anti HCV antibodies and 239 cases showed positive results indicating a seropositivity rate of 3.01%. Demographic distribution of positive cases showed 61.5% male and 38.5% females. Most of the cases occurred in the >40 years age group (n=168, 70.3%), followed by 21-30 years (n=41, 17.2%), 31-40 years (n=24, 10%) and <20 years (n=6, 2.5%). [Figure 1] Displays the gender distribution of cases that tested positive in the study.

HBV seroprevalence: During the five-year study period, 7,816 samples were tested for Hepatitis B surface antigen (HBsAg). HBsAg was positive in 60 patients, resulting in an overall seropositivity rate of 0.77%. Among the positive cases with HBsAg, 31 (51.7%) were males and 29 (48.3%) were females. Age wise distribution showed 35 (58.3%) cases in age group >40 years followed by 12 (20%) cases, 10 (16.7%) cases and 3 (5.0%) cases in age range of 31-40 years, 21-30 years and <20 years respectively. [Figure 2] Depicts the distribution of positive cases by age in the study.

HIV seroprevalence: Over the duration of 5 years, total 8047 patients were screened for the HIV by anti-HIV antibodies and 30 patients were found to be HIV positive indicating a 5 years prevalence rate of 0.37%. Age distribution of the HIV cases revealed that most of the patients belonged to the >40 years (n=12, 40%), followed by 21-30 years (n=11, 36.7%), 31-40 years (n=6, 20%) and 1 case in age group of <20 years. Out of the 30 HIV positive cases, 20 (66.6%) were male and 10 (33.3%) were female.

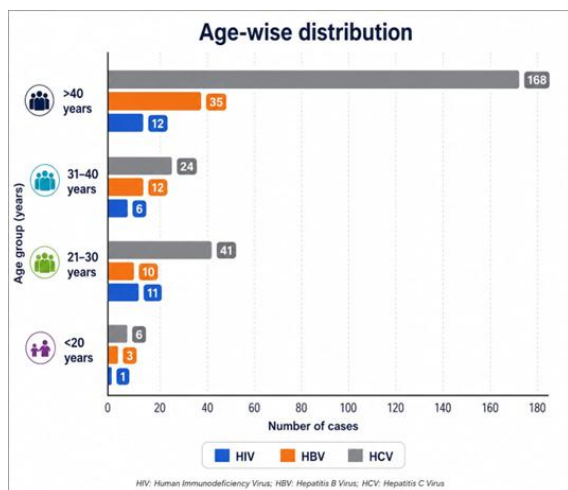


Figure 1: Age wise distribution of the serological viral markers (HCV, HBV, HIV)

Coinfections: In the study population, co-infection was found in 12 patients [HIV-HBV (n=1), HBV-HCV (n=3), and HIV-HCV (n=8)]. A 76-year-old male patient was co-infected with HIV and HBV. HBV-HCV co-infection was identified in three patients, all of whom were female; two were aged over 70 years, while one was 27 years old. HIV-HCV co-infection was found in eight male patients. Age-

wise analysis revealed that five patients were in the 21- 30 year group, two were in the 31- 40 year group, and one was aged over 40.

In the present study, HIV seroprevalence reached its peak in 2020 (0.7%), while HBV and HCV seroprevalence peaked in 2021 at 1.0% and 4.2%, respectively. Overall, the seroprevalence of HIV, HBV, and HCV remained relatively stable over the past five years, with observed ranges of 0.1%–0.7% for HIV, 0.6%–1.0% for HBV, and 2.4%–4.2% for HCV. Table 1 and Figure 3: Shows distribution of total samples and seropositive cases of HCV, HBV, and HIV. Figure 4 Presents the seroprevalence trend of HIV, HBV and HCV over the study period.

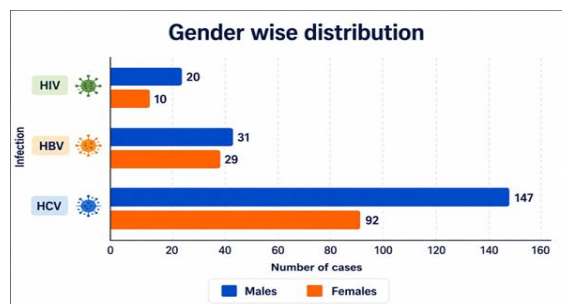


Figure 2: Gender wise distribution of the serological viral markers (HCV, HBV, HIV).

Table 1: Distribution of total samples and seropositive cases over the five-year duration.

Year	HIV			HBV			HCV		
	Total	Positive	Prevalence	Total	Positive	Prevalence	Total	Positive	Prevalence
2020	1653	11	0.7%	1625	10	0.6%	1653	49	3%
2021	1462	8	0.5%	1429	15	1%	1464	62	4.2%
2022	1354	2	0.1%	1327	12	0.9%	1327	32	2.4%
2023	1699	5	0.3%	1631	10	0.6%	1638	45	2.7%
2024	1879	4	0.2%	1804	13	0.7%	1854	51	2.8%
Total	8047	30	0.4%	7816	60	0.8%	7936	239	3.01%

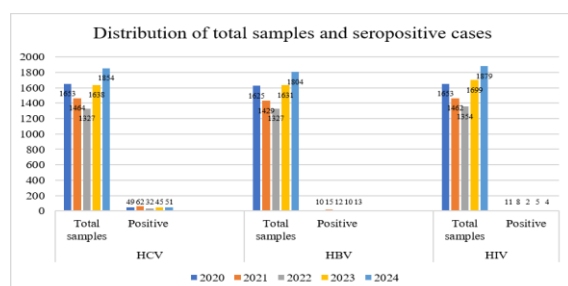


Figure 3: Distribution of total samples and seropositive cases for viral markers (HIV, HBV, and HCV).

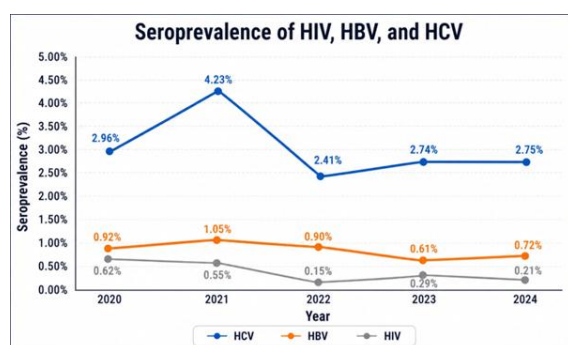


Figure 4: Trends in HIV, HBV, and HCV seroprevalence over five years

DISCUSSION

The present study aimed to assess the seroprevalence of anti-HIV, HBsAg, and anti-HCV antibodies among patients attending a tertiary care hospital from 2020 and 2024. The seroprevalence study of blood borne viral infections such as HCV, HBV and HIV provides asymptomatic burden within the population. Seroprevalence studies are helpful in the detection of geographical distribution, sociodemographic variables among vulnerable population in order to perform risk-based screening, prioritizing key population for preventive and therapeutic strategies. Our study on the seroprevalence of HIV in 8047 patients revealed that 0.37% were tested positive for anti-HIV antibodies. In the study by Kulkarni, the prevalence of HIV infection was 0.91%.^[12] Seropositivity of HIV in other studies was observed to be in range between 0% to 0.5%.^[13-15] Mujeeb et al. reported no HIV reactive cases among 839 family blood donors, corresponding to a seroprevalence of 0%.^[16] The study by Sibia et al. identified 38 HIV positive subjects, corresponding to a seroprevalence rate of 1.03%.^[17] The findings of the present study align with previous published studies.^[13,15] India is

classified as a low HIV prevalence nation. The National AIDS Control Organization (NACO) estimates the prevalence of HIV in adult male and adult female population to be 0.21% and 0.19% in 2025.^[18] The HIV prevalence in Punjab was 0.42 (Male: 0.47 and Female: 0.37) in 2025.^[18] In the present study also, HIV was predominantly seen in male (66.7%) population. The trend in the HIV prevalence among adults has been rising sharply over past years in Punjab with 13 districts having prevalence rates ranging between $\geq 0.40\%$ & $< 1.0\%$ and 10 districts with prevalence rates between $\geq 0.20\%$ & $< 0.40\%$. In Patiala, district of Punjab the HIV prevalence was 0.41%.^[18] The scattered distribution in HIV prevalence can be due to regional epidemics such as injectable drug usage, migrant labour population, districts near to international border, poor accessibility to testing and treatment etc. In current study, overall prevalence of HBV over five years was 0.77%. The prevalence was lower in females (48.3%) than males (51.7%) and varied by age, with the maximum individuals in age group above 40 years (n=35, 58.3%). The correlation of HBV with older age and male population is well established in various studies.^[19,20] Global prevalence of HBV infection by analysing HBsAg estimates, 3.8% in the general population in 2019,^[21] and estimated prevalence in India ranges from 2% to 8%. Seroprevalence of HBsAg by Kulkarni et al was 3.2%.^[12] In various other studies seroprevalence of HBsAg range between 1.7% to 5%.^[13,14] In a study by Nahvi et al. 1.88% patients tested positive for HBsAg, with a greater prevalence among males (114, 1.23%) than females (60, 0.64%).^[17] Shadaker et al. reported HBsAg prevalence of 1.4% in the Punjab region of North India.^[19] In another study from same region by Bakshi et al., showed HBV prevalence of 1.69%.^[22] In contrast to other studies, the lower seroprevalence in our study can be due to geographic heterogeneity and variable endemicity across different populations. The burden of HCV is higher than HBV in Punjab despite of shared risk factors and transmission routes. However, there are few studies on HBV burden in Punjab region. Therefore, our study facilitates to the existing knowledge on the seroprevalence of HBV in addition to HCV and HIV in Punjab region of North India.

HCV infection is an ongoing public health issue, showing wide variation in prevalence across different regions. In current study, total 7936 individuals were screened for anti HCV antibodies over the study period and 239 (3.01%) were found to be positive. A study by Sood et al. reported a prevalence of 3.6%, which is comparable to our study (3.01%).^[23] A community-based study from North India reported a prevalence of 3.6%.^[23] According to Indian studies, the seroprevalence of HCV varies from 1.8 to 2.5%.^[21,24] In a meta-analysis by Goel et al., showed HCV seroprevalence to be 0.88% in pregnant women, 0.85% in community setting and 0.44% in blood donors.^[25] In contrast to our finding, study by Bakshi et al. showed HCV seropositivity of 7.5%.^[22]

In our study, a higher HCV seropositivity was seen in males (61.5%) in comparison to females (38.5%). This observation is consistent with published studies, such as those by Guss et al. and Bakshi et al.^[20,22,23,26] The variations in HCV seroprevalence can be multifactorial due to following reasons: study populations, study design (cross-sectional versus longitudinal approaches), socioeconomic conditions and behavioural risk patterns.

Temporal trends indicate stable HIV seroprevalence over the past five years, likely due to increased awareness and better screening strategies. Similarly, HBV seroprevalence has shown a downward trend since 2021, which may be attributed to widespread immunization programs and effective infection control practices. Despite exhibiting a stable trend over the five-year period, HCV demonstrated the highest seroprevalence among all viral markers, which may be attributed to intravenous drug use and the lack of a universal vaccine.

The presence of three blood-borne viruses (HIV, HCV, HBV), can have a substantial impact on morbidity and pose significant challenges to global health. Due to similar methods of transmission of these viruses, including blood borne, sexual practices, use of shared injectables, and vertical route, there is high likelihood of co-infections.^[27] In our study, HIV-HCV (n=8) co-infection was the most prevalent, followed by HBV-HCV (n=3) and HIV-HBV (n=1). Various research has shown that the prevalence of HCV and HBV varies, despite of shared predisposing factors. The low prevalence of HBV infection can be attributed due to extensive availability of vaccination and lower rates of chronicity. Factors such as higher chronicity, absence of a vaccine, and asymptomatic infection for years result in hidden reservoirs, which promote ongoing transmission among vulnerable populations and partially explain the relatively high prevalence of HCV.^[18]

The design of this study, being retrospective, entails certain limitations. The socio-demographic factors and laboratory-based clinical parameters for HIV, HBV and HCV- positive cases were not available. The inclusion of only hospital-seeking individuals may restrict the generalizability of the findings to the wider North Indian community. Further population-based studies incorporating prospective data are required to better understand the epidemiology of HIV, HBV, and HCV.

CONCLUSION

The present study provides valuable insights into the seropositivity rates of HBV, HCV and HIV in the study population. The presence of three blood-borne viruses (HIV, HCV, HBV) can have a substantial impact on morbidity and pose significant challenges to global health. By identifying at-risk populations and monitoring infection trends, such studies play an essential role in guiding effective interventions and

reducing the burden of these viral infections on healthcare systems and communities

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