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# Co-infection Amongst Seroreactive Hepatitis C Virus and Hepatitis B Surface Antigen Patients in a Tertiary Care Hospital

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## ABSTRACT

**Background:** Hepatitis C virus (HCV) and hepatitis B virus (HBV) have several similarities like hepatotropism, modes of transmission, ability to induce chronic infection, cirrhosis and hepatocellular carcinoma. **Objective:** The study was undertaken to know the seroprevalence of HCV and hepatitis B surface antigen (HBsAg) along with their co-infection in outdoor and indoor patients. **Material and methods:** This prospective study was done in the Dept. of Microbiology over a period of 12 months. The study comprised of 885 seroreactive patients of HCV and HBsAg. Their serum was screened for co-infection by detecting anti-HCV antibodies and HBsAg by using rapid card tests. **Results:** Maximum seroreactivity was observed in the age group of 21-40 years (66.21%) and most of them were intravenous drug users (IDUs). HCV seropositivity was more as compared to HBV infection. Among the seropositive males, 84.14% were seroreactive for anti-HCV antibodies and 15.86% were seroreactive for HBsAg. Amongst the female patients, 67.46% were seroreactive for anti-HCV antibodies and 32.54% were seroreactive for HBsAg. The co-infection was found in male patients only (3.05%) and maximum in the age group of 21-40 years (81.81%). **Conclusion:** Patients with dual HBV and HCV infection have more severe liver disease and are at an increased risk for progression to hepatocellular carcinoma.


**Keywords:** Hepatitis C virus, HBsAg, co-infection, seroprevalence

Hepatitis B and C viruses (HBV and HCV) are endemic in India.[1,2] In India, the prevalence rate of HBV is 3.7%, with over 40 million HBV carriers, which constitutes 11% of the estimated global burden[3] and approximately 1.8-2.5% of Indian population is infected by HCV.[2,4] HBV and HCV have several important similarities, including worldwide distribution, hepatotropism, similar modes of transmission, and the ability to induce chronic infection that may lead to liver cirrhosis and hepatocellular carcinoma.[5,6]

In HBV endemic areas, a substantial proportion of patients are dually infected with hepatitis C and B,[7-9] and can be found in individuals at risk of parenteral hepatotropic viral transmission, such as intravenous drug users (IDUs), thalassemic and hemophiliac patients.[10] The exact prevalence of co-infection is actually unknown. It is estimated to be between 0.7% and 16%, a percentage that ranges over a wide interval among several studies in the literature, mainly depending on the geographical region and the study population.[11-13]

Liver disease activity and progression are generally more severe in the presence of double infection; the host's immune response plays an important role in coordinating each single viral replication and the viral interference, usually leading to a predominance of one of the two viruses. HCV superinfection is more frequent, while HBV superinfection is rare. In addition, acute HBV/HCV co-infection is more prevalent in IDUs. Most HBV/HCV co-infected patients have HCV RNA levels similar to those in patients with HCV mono-infection, but relatively lower levels of serum HBV DNA compared to patients with chronic HBV mono-infection. Several clinical scenarios have been described in the natural course of this dual infection.[14] The present prospective study was done to analyze the seroprevalence of HBV and HCV viral markers and their co-infection.

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## MATERIAL AND METHODS

The present prospective study was conducted at Dept. of Microbiology, Punjab Institute of Medical Sciences, Jalandhar, from October 2017 to September 2018. The study group comprised all HBV/HCV positive patients and those patients who had co-infection. Patients who were co-infected with human immunodeficiency virus (HIV) were excluded. Approval of the Institutional Ethics Committee was obtained before beginning with the study.

About 5 mL of venous blood samples were collected in clean vials and blood was allowed to clot for 45 minutes at room temperature and the serum separated after centrifugation at low speed. These samples were tested for detection of hepatitis B surface antigen (HBsAg) and anti-HCV antibodies by Rapid visual tests. HBsAg detection was done by Hepacard test, which uses solid-phase immunochromatographic technology for the qualitative detection of HBsAg in serum or plasma. Anti-HCV antibodies detection was done by HCV Tridot-Rapid visual test based on solid-phase immunochromatography. The results of these tests were interpreted as per the instructions from the manufacturers. All seroreactive samples were confirmed by enzyme-linked immunosorbent assay (ELISA) test. Ethical norms were strictly adhered to. Statistical analysis was done.

## RESULTS

Out of 885 seroreactive patients, 719 (81.25%) were male and 166 (18.75%) were female with male-to-female ratio of 4.3:1 (Table 1). Maximum seroreactive persons were in the age group of 21-40 years (66.21%) and maximum of them were IDUs. Age-wise distribution of HBsAg and HCV seroreactive patients is shown in Table 2. In the final analysis, 885 seroreactive patients were divided into three groups: Group A had 22 (2.48%) patients with HBV/HCV co-infection, Group B had 717 (81%) with seroreactive hepatitis C and Group C had 168 (19%) with seroreactive hepatitis B infection (Tables 2 and 3).

HCV seropositivity was more in both males and females as compared to HBV infection. Among the seropositive males, 84.14% were seroreactive to anti-HCV antibodies, whereas 15.86% were seroreactive for HBsAg. Amongst the female patients, 67.46% were seroreactive for anti-HCV antibodies and 32.54% were seroreactive for

**Table 1.** Sex- and Age-wise Distribution of Seroreactive Patients

| Gender | 10-20 years | 21-40 years | 41-60 years | 61-80 years | Total |
|---|---|---|---|---|---|
| Male | 31 | 515 | 108 | 65 | 719 |
| Female | 09 | 71 | 56 | 30 | 166 |
| **Total** | **40** | **586** | **164** | **95** | **885** |

**Table 2.** Age-wise Distribution of HBsAg and HCV Seroreactive Patients

| Infection | 10-20 years | | 21-40 years | | 41-60 years | | 61-80 years | |
|---|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female | Male | Female |
| HCV | 21 | 05 | 447 | 43 | 90 | 43 | 47 | 21 |
| HBV | 10 | 04 | 68 | 28 | 18 | 13 | 18 | 09 |
| **Total** | **31** | **09** | **515** | **71** | **108** | **56** | **65** | **30** |
| Co-infection | 02 | Nil | 18 | Nil | 01 | Nil | 01 | Nil |

**Table 3.** Seroreactive Patients in Different Groups

| Groups | Seropositive Persons | Percentage (%) |
|---|---|---|
| Group A (Co-infection) | 22 | 2.48 |
| Group B (HCV) | 717 | 81 |
| Group C (HBV) | 168 | 19 |

HBsAg. The co-infection was found in male individuals only (n = 22, 3.05%). Among the age groups, variable co-infection was found to be more frequent in the age group of 21-40 years (81.81%).

## DISCUSSION

In the present study, a total of 885 hospitalized and non-hospitalized patients seroreactive for HCV and HBsAg were included with higher incidence in males (81.25%) with male-to-female ratio as 4.3:1. Similarly Grewal et al[2] and Singh et al[15] also reported higher incidence in males, that is, 4:1 and 2.3:1, respectively. This male predominance was also seen in a study conducted by Saravanan et al in patients with chronic liver disease where males comprised of 74% and females were 26%.[16] The sex difference in hepatitis B and hepatitis C prevalence may be due to a difference in viral exposure with men being more exposed as a result of more active lifestyle or behavior.[17]

In our study, the seroprevalence of HCV and HBV antibodies in males were 68.36% and 12.88% and in females were 12.65% and 6.10%, respectively, whereas other workers reported it to be 40.7% and 15.4% in males and 1% and 1.9% in females, respectively.[18]

The maximum seroreactive persons were in the age group of 21-40 years (66.21%). The seroprevalence of HCV and HBsAg were higher in this age group, with 68.34% and 57.14%, respectively. However, other workers reported HCV seroreactivity to be 46.6% in the age group 33-42 years and HBsAg seroreactivity to be 42.3% in the age groups of 22-32 years.[19] The prevalence of HCV and HBV infections is not uniform throughout India.[1,20] The disparity in the findings of various studies may be due to difference in types of serological techniques used for diagnosis or differences in study population, risk factors and risk behaviors among them.

The seroprevalence of HCV and HBV co-infection was 2.48% in our study and almost similar prevalence of co-infection was reported by Xess et al (3%),[21] whereas other workers reported it to be 16% and 6%, respectively.[10,15]

The estimated prevalence of HBV/HCV dual infection worldwide is approximately 5-20% in HBsAg positive patients and 2-10% in HCV positive patients.[22] In India, the prevalence of HCV/HBV co-infection was reported to be 1.89% in a review study done by Desikan et al.[23]

In the present study, co-infection was seen in male patients only and maximum co-infection (81.81%) was seen in the age group of 21-40 years with maximum history of IDU in male patients (Table 2). The dual infection of HBV/HCV is a fairly frequent occurrence particularly in highly endemic areas and among subjects with a high risk of parenteral infections.[24] Kruse et al documented a significantly greater risk of developing cirrhosis of liver among co-infected patients as compared to mono-infected patients.[25] It has been found that liver disease activity and prognosis are generally more serious in the presence of double infection; although an inverse relationship in the replicative levels of the two agents has been noted, suggesting viral interference. Thus, the two viruses seem to inhibit each other at the molecular level, while cytopathic effects appear to be enhanced.[26]

## CONCLUSION

The seroprevalence of HBV and HCV and their dual infection is not uncommon in endemic areas and among persons at risk of IDU and other risk groups. The observed rates likely reflect the patients served by our hospital only. There may be more cases of acute HBV/HCV co-infection than are actually identified because it requires a long follow-up period with careful observation for diagnosis. How two viruses interact with each other in the same liver awaits further *in situ* and *in vitro* studies and large-scale studies are needed to understand the epidemiology of HCV and HBV infections.

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## USPSTF Recommends Screening for Hepatitis B Virus Infection in Pregnant Women

In a statement published in *JAMA*, the United States Preventive Services Task Force (USPSTF) has reaffirmed its previous conclusion that there is convincing evidence that screening for hepatitis B virus (HBV) infection in pregnant women provides substantial benefit. The USPSTF recommends screening for HBV infection in pregnant women at their first prenatal visit (Grade A recommendation). The principal screening test for detecting maternal HBV infection is the serologic identification of hepatitis B virus surface antigen (HBsAg). Screening should be performed in each pregnancy, regardless of previous HBV vaccination or previous negative HBsAg test results.