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Seroprevalence Of Hepatitis B, Hepatitis C And HIV 1 / 2 IN Patients Undergoing Surgery In A Tertiary Care Hospital

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ABSTRACT

Introduction: Hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) are significant global health threats that share common routes of transmission, especially through contaminated blood and surgical procedures. Identifying seroprevalence in patients undergoing surgery is essential to minimize occupational exposure and provide timely medical intervention. Screening for HIV, Hepatitis B, and Hepatitis C in patients having elective surgery was the study's goal in order to decrease transmission to healthcare professionals and offer preventive and treatment services.

Aim and Objective: To study the seroprevalence of hepatitis B, hepatitis C and HIV 1 / 2 in patients undergoing surgery in a tertiary care hospital

Materials and methods: The study involved the recruitment of patients scheduled for elective surgery, who were screened for HBs Ag and antibodies to HIV 1/2 and hepatitis C, respectively, using coomb AID, a rapid immunoassay test, to identify the antibodies to HIV 1/2, and SD HBs Ag ELISA 3.0 and SD HCV ELISA 3.0 to detect HBs Ag and IgG antibodies to HCV, respectively.

Results: The prevalence of HBV and HCV infection, respectively, was 1.91% and 1.05% in our study. Three individuals (0.03%) tested positive for both HBV and HCV. HIV was not detected in any of the individuals.

Conclusion: Surgical patients have a high seroprevalence of viral infections with hepatitis B and hepatitis C. Risk factors include not taking pre- and postoperative precautions, using infected syringes and surgical instruments again, and more.

Keywords: *Seroprevalence, Hepatitis B, Hepatitis C, Hiv 1 / 2, Surgery*

1. INTRODUCTION

Three significant viral infections HBV, HCV, and HIV all have similar ways of spreading, with tainted blood and blood products being the most significant [1]. Inoculation during dental or surgical procedures is another way that transmission happens [2]. After a contaminated needle stick injury, the risk of spreading HIV, HBV, and HCV is around 0.3%, 3%, and

30%, respectively. Vertical transmission from infected mother to fetus and sexual interaction, particularly in homosexual males, are the other mechanisms of infection.

Patients on dialysis, hemophiliacs, drug abusers, paramedical personnel, sex workers, surgeons, patients receiving repeated blood transfusions, and patients undergoing solid organ transplantation are among the high-risk populations that are more likely to contract infections. Cirrhosis, hepatocellular cancer, and chronic hepatitis are all major outcomes of HBV and HCV infections. Over 500 million people worldwide have chronic hepatitis [3].

HBV is a double-stranded DNA virus with ten genotypes that is a member of the family Hepadnaviridae and genus Orthohepadnavirus. 257 million individuals have a chronic HBV infection [4,5]. Chronic HBV infection-related consequences, such as cirrhosis and hepatocellular cancer, cause one million deaths annually. Asia is thought to have a prevalence of above 10%, mostly from prenatal transmission, with a 90% chance of developing a chronic infection after that. Over 95% of otherwise healthy adults who get the illness recover. The most crucial and accurate test for identifying HBV infection is the detection of HBs Ag.

It is the earliest increased signal and typically manifests 8–12 weeks, around 2–6 weeks ahead of the biochemical and clinical signs of hepatitis. Usually, the antigen is eliminated in a month or two. If it lasts longer than six months, it may indicate a carrier condition and the development of chronic hepatitis [6,7]. Hepatitis B core antigen (HBc Ag) is not seen in blood because it is nonsecretory and encircled by HBs Ag. The first antibody to rise upon infection is antibody to HBc Ag (IgM), which manifests 1-2 weeks after HBs Ag emerges and persists for 3-6 months. Acute hepatitis B infection is indicated by its presence. The presence of HBs Ag in serum is followed or coincident with the emergence of HBeAg and HBV DNA, which are indicators of active viral replication and high viral infectivity (i.e., high transmission rate). During the early stages of incubation, the presence of HBs Ag can be the sole indicator. Antibody to HBs Ag after infection indicates non-infectivity and recovery from infection, and it lasts indefinitely [8-10].

HCV is a single-stranded RNA virus that is a member of the Flaviviridae family and genus Hepaciviral. Currently, there are six genotypes (1–6) of HCV, and due to its high mutation rates, it is considered a quasi-species.8. The most frequent means of transmission are the use of unscreened blood and blood products, hazardous injection procedures, and exposure to trace amounts of blood during drug misuse. 71 million people worldwide suffer from a chronic HCV infection, which puts them at risk for cirrhosis and hepatocellular cancer [11,12].

An estimated 399000 persons pass away from HCV. Due to a robust immune response, around 30% of HCV-infected people may recover from the virus [10]. HCV RNA, the gold standard for diagnosing HCV infection, can be found within days of exposure. After infection plateaus, viremia peaks 8–12 weeks later and then declines to a lower level. Approximately 85 to 90 percent of the people have an ongoing infection. The main effect of an HCV infection is hepatic fibrosis, which can lead to cirrhosis, which can be fatal, and an elevated risk of hepatocellular cancer.

More than 95% of chronic cases have anti-HCV antibodies, which show up 8–9 weeks after exposure. In contrast, 50–70% of individuals with acute hepatitis have antibodies. The most reliable method for diagnosing hepatitis C is still the detection of HCV RNA. Therefore, nucleic acid amplification should be used to validate the presence of anti-HCV in patients. Co-infections between HBV and HCV have been documented in high-risk patients who were screened prior to surgery. In one study, 14.7% of HIV patients tested positive for anti-HCV and 28.4% tested positive for HBS Ag.

The human immunodeficiency virus (HIV), which causes AIDS, is an RNA virus that is a member of the genus Lentivovirus and family Retroviridae. HIV-1 and HIV-2 are the two viruses that are currently known to exist. HIV-1 is linked to the majority of infections. After infecting a host cell, retroviruses use a special enzyme called reverse transcriptase to control the synthesis of DNA from viral RNA.

In 75% of cases, the virus is mainly spread through heterosexual contact. Percutaneous, mucosal, perinatal, and contaminated blood are other ways of transmission. Blood, vaginal secretions, cerebral fluid, and breast milk have the highest viral loads. Rapid tests (less than 30 minutes), ELISA (two to three hours), and screening tests for antibody detection are among the laboratory testing for HIV. Three screening tests based on various principles or antigens are conducted in accordance with NACO (National AIDS Control Organization) standards. The first test must be highly sensitive, and if it comes back positive, the second and third tests, which have high specificity, must confirm it.

2. MATERIALS AND METHODS

This was a prospective and observational study carried out in the Department of Surgery for a period of 12 months i.e, February 2024 to February 2025 at a tertiary care centre. The study included individuals who were scheduled for elective surgery in the ENT, ophthalmology, and general surgery departments. A total of 9252 patients had their HBs Ag and HIV and HCV antibodies checked. HBs Ag and HCV antibodies were detected using SD HBs Ag ELISA 3.0 and SD HCV ELISA 3.0. Quick detection of HIV-1 and HIV-2 antibodies.

2.1. Collection and storage

Under all proper aseptic precautions whole blood was collected by venipuncture, centrifuged to get serum specimen. The specimens were then refrigerated as the tests were done on two specific days each week.

2.2. ELISA for hepatitis B surface antigen (HBsAg)

A double sandwich ELISA for the qualitative identification of HBs Ag in human serum or plasma is the SD HBs Ag ELISA 3.0. Anti-hepatitis B virus surface antigen (anti-HBs) is applied to the microplate beforehand. The patient's serum and conjugate are added one after the other during the initial incubation. If HBs Ag is found in the patient's serum, it binds to the well's anti-HBs. Additionally, an enzyme conjugate including horse radish peroxidase (HRPO) conjugated to anti-HBs is added. In order to create a sandwich, the HBs Ag will also conjugate with the Anti-HBs. After this incubation, aspiration and washing were used to remove all of the loose material.

By incubating the solid phase with a substrate solution (TMB) in a substrate buffer, the residual enzyme activity in the well is demonstrated to be directly proportional to the HBs Ag concentration in the patient's serum. The stopping solution is 1.6 N sulfuric acid. Three negative and two positive controls were included for every run. A spectrophotometer set to 450 nm was used to take colorimetric readings for each run. Results interpretation: The negative control's mean absorbance was computed. The cutoff value was then determined by adding 0.050 to the negative controls' mean absorbance (per the kit instruction).

The positive serum samples were also tested by Rapid tests to confirm their efficacy (Fig. 1 and Fig. 4).

2.3. ELISA for anti HCV

SD HCV ELISA 3.0 is an indirect sandwich ELISA for the qualitative detection of antibodies against HCV. Here the microplate is pre coated with recombinant HCV antigens (core, NS3, NS4, NS5). During first incubation anti HCV in patient's serum is bound to recombinant HCV antigens. Following this the unbound materials are removed by aspiration and washing. The enzyme conjugate containing goat antihuman IgG conjugated to horse radish peroxidase (HRPO) binds to anti HCV.

Incubating the solid phase with substrate solution (TMB) demonstrates that the residual enzyme activity in the wells is directly proportional to the anti-HCV concentration in the patient's serum. The stopping solution in a substrate solution is 1.0 N sulfuric acid. We placed three negative and two positive control wells for every run. interpretation of the findings: A value of 0.400 is added to the estimated mean absorbance of negative wells. The cut off is thus provided (per the package insert). The samples that tested positive were examined twice. To examine the effectiveness of rapid tests, HCV tests were also performed for positive specimens (Fig. 2 and Fig. 3).

3. RESULTS AND DISCUSSION

In the present study a total of 9252 patients were screened for the three viral infections.

Fig. 1. ICT showing test positive for HBsAg.

Fig. 2. ICT showing test positive for HCV.

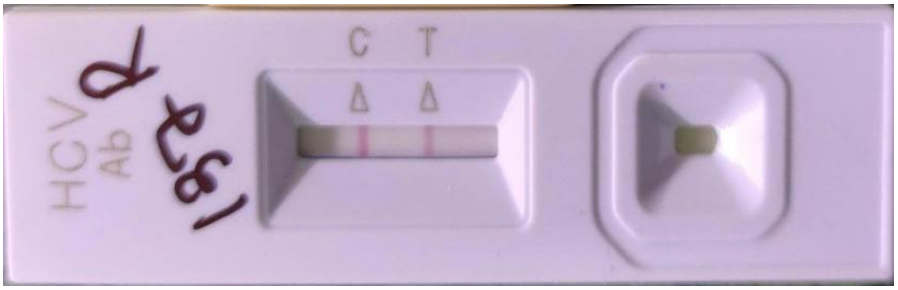

Fig. 3. ELISA for HBV; 2F, 5E ,6G positive for HBsAg, 12Hpositive control.

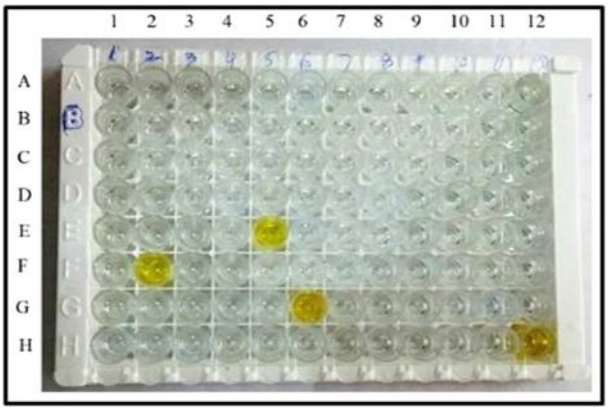

Table 1 Prevalence of Hepatitis B, Hepatitis C and HIV.

Infections	Males (n =4901)	Females (n =4351)	Total (n =9252)	%
HBV	**114**	**60**	**174**	**1.88**
HCV	**50**	**48**	**98**	**1.05**
Co-infection (HBV and HCV)	**3**	**-**	**3**	**0.03**
HIV	**-**	**-**	**-**	**-**
Total	**167**	**108**	**275**	**2.97**

There were 4351 (47.02%) females and 4901 (52.97%) males among them. Three male patients were positive for both HCV and HBs Ag co-infection, 98 patients tested positive for HCV, and 174 patients tested positive for HBs Ag. According to Table 1, none of the patients tested positive for HIV 1/ 2. Males were more likely to test positive for HBs Ag (114, 1.23%) than females (60, 0.64%), with a total of 1.88% of patients testing positive. The percentage of patients with positive anti-HCV test results was 1.02%. In our investigation, HCV was far less common than HBV.

The prevalence of hepatitis C infection was somewhat greater in males (0.54%) than in females (0.51%) (Table 1). Only three patients had positive results for co-infection with both hepatitis B and hepatitis C. These patients included two hemophiliacs and one who had been diagnosed with rectal cancer and tested positive for HBs Ag and HCV following chemotherapy. There is evidence of co-infection between HBV and HCV in immunocompromised people, which increases their risk of cirrhosis, hepatocellular carcinoma, and CLD [13,14] HIV 1/ 2 was not detected in any of the individuals.

The immuno-chromatographic test (Rapid Method) confirmed that all of the samples tested ELISA positive for HBs Ag and HCV (Figs. 1 and 2). Rapid tests, which have a high specificity, are therefore equally effective and can be utilized when findings are required right away, particularly in patients who have pellet injuries. They are quick, easy, and require no special equipment or setup in a lab. Our research was comparable to similar studies carried out globally. A New York investigation on the seroprevalence of HCV, HIV, and HBV in surgical patients revealed that anti-HCV (5.2%), HIV (1.6%), and HBV (1.4%) were prevalent.

HIV prevalence was 1.6% and HBV prevalence was 1.4%, however HCV prevalence was 5.2% ($P < 0.001$) [15] . HBV and HCV prevalences in neurosurgical patients were found to be 1.88% and 1.02%, respectively, in a related investigation. There were no HIV-positive patients.12 In a study of pre-operative patients in northern India, the prevalence of HIV, HBV, and HCV was found to be 2.09%, 1.77%, and 0.25 percent, respectively [16].

The seroprevalence observed in our study—HBV (1.88%) and HCV (1.05%) with no detected HIV infection—is in line with findings reported globally and in similar hospital-based studies. Montecalvo et al. [17,18] found a comparable prevalence in a U.S. surgical cohort, with HBV at 1.4%, HCV at 5.2%, and HIV at 1.6%, underscoring the importance of preoperative

screening to protect healthcare workers and reduce cross-contamination risks.

In India, Mohan et al. [19] reported HBV at 1.77%, HCV at 0.25%, and HIV at 2.09% among preoperative patients, indicating regional differences in HIV prevalence but confirming the value of routine viral screening. Similarly, Gańczak and Szych [20] in a Polish study, argued against routine HIV screening due to lower prevalence compared to HBV and HCV, further supporting our finding of absent HIV cases in surgical patients.

Co-infections, although rare, were also reported in prior studies. Balogun et al. in Nigeria and Sulkowski in a broader review emphasized that co-infection increases the risk of liver complications like cirrhosis and hepatocellular carcinoma, which aligns with the three co-infected cases in our cohort [21,22].

Our findings reinforce the consistent global trend of relatively high HBV and HCV rates among surgical candidates and suggest the efficacy and necessity of rapid tests, which are simple, cost-effective, and suitable for emergency or resource-limited settings.

It has been advised to perform routine pre-operative HBV and HCV screening. Patients who have a chronic hepatitis B or hepatitis C infection can be identified early and given the care and therapy they need to stop or slow the course of liver damage. Testing also offers a chance to lower transmission to medical personnel and supply preventative supplies like surgical instruments and sterile syringes.Health care professionals are at significant risk for contracting hepatitis B. The Hepatitis B vaccination is extremely safe and effective, and it should be administered to all healthcare workers and others who are at risk. The antibody titer should be tracked so that a booster dose is administered when it drops below 10 IU/ml.

Therefore, it is our recommendation that all patients undergoing surgery be screened for hepatitis B and C infections. Promoting early antiviral medications is also important because they can cure more than 95% of hepatitis C infections, lowering the risk of cirrhosis and hepatocellular carcinoma-related deaths.

4. CONCLUSION

This study affirms the necessity of routine preoperative screening for HBV and HCV among surgical patients. The relatively high seroprevalence of these viruses, particularly hepatitis B, highlights the need for stringent infection control measures and early antiviral intervention. Although HIV was not detected in our cohort, universal precautions remain vital. Our findings emphasize protecting both patients and healthcare workers while enabling timely therapeutic decisions. We recommend making HBV vaccination and screening an institutional protocol for all surgical admissions to mitigate transmission risks and improve public health outcomes.

DECLARATIONS:

Conflicts of interest: There is no any conflict of interest associated with this study

Consent to participate: There is consent to participate.

Consent for publication: There is consent for the publication of this paper.

Authors' contributions: Author equally contributed the work.

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