



BURDEN OF HEPATITIS B VIRUS INFECTION IN PRE-SURGICAL PATIENTS OF A RURAL NORTH INDIAN HOSPITAL: INSIGHTS FROM A CROSS-SECTIONAL STUDY

Dr. Sheetal Agarwal¹, Dr. Akshat Agarwal², Dr. Raees Ahmed³, Dr. Nashra Afaq⁴,
Dr. Siddharth Mishra⁵, Dr. Parvez Ahmad Ansari⁶, Dr. Gyan Prakash Rastogi⁷, Dr. Atiullah
Mohammad Imran Malik^{8*}

¹Assistant Professor, Department of Microbiology, Hind Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.

²Assistant Professor, Department of Surgery, Rohilkhand Medical College, Bareilly, Uttar Pradesh, India.

³Assistant Professor, Department of Microbiology, Sudha Medical College and Hospital, Jagpura, Kota, Raj, India.

⁴Assistant Professor, Department of Microbiology and Central Research Laboratory, Rama Medical College Hospital and Research Centre, Uttar Pradesh, India.

⁵Assistant Professor, Department of General Surgery, Naraina Medical College & Hospital, Kanpur

⁶Assistant professor, Department of General Surgery, Autonomous State Medical College, Tiloi, Amethi, Uttar Pradesh, India.

⁷Associate Professor, Department of Surgery, Hind Institute of Medical Sciences, Atariya, Sitapur, Uttar Pradesh, India.

^{8*}Assistant Professor, Department of General Medicine.

***Corresponding Author:** Dr. Atiullah Mohammad Imran Malik
Email ID: Dr. malik9002atiullah@gmail.com

ABSTRACT

Background: Hepatitis B virus (HBV) remains a significant public health challenge, especially in intermediate endemic regions such as India. Routine preoperative screening aids in early detection of asymptomatic carriers and helps prevent nosocomial transmission.

Objectives: To determine the seroprevalence of hepatitis B surface antigen (HBsAg) among pre-surgical patients at a tertiary care hospital.

Methods: A retrospective cross-sectional study was conducted among 650 patients undergoing elective surgeries in the departments of General Surgery, Orthopaedics, ENT, and Ophthalmology. Serum samples were tested for HBsAg using a rapid immunochromatographic assay. Demographic variables such as age, gender, literacy, marital status, occupation, and coinfections with hepatitis C virus (HCV) and human immunodeficiency virus (HIV) were recorded. Statistical analysis was performed using Chi-square tests, with $p \leq 0.05$ considered significant.

Results: Of 650 preoperative patients screened, 14 were positive for HBsAg, giving an overall seroprevalence of 2.15%. Among these, 10 (71.4%) were males and 4 (28.6%) were females, corresponding to gender-wise prevalence of 2.6% and 1.4%, respectively ($p < 0.05$). The highest seropositivity occurred in the 21–40-year age group (36%), followed by 41–60 years (29%), >60 years (21%), and 0–20 years (14%). Most seropositive patients were married, illiterate, and engaged in agricultural work. Coinfections included one case (7.1%) with HCV and none with HIV.

Conclusion: The study emphasizes the importance of mandatory preoperative screening for HBV to detect asymptomatic carriers and reduce occupational and hospital-based transmission. Regular surveillance and HBV vaccination awareness programs are crucial, particularly in rural and resource-limited populations.

Keywords: Hepatitis B, Seroprevalence, Pre-surgical screening, Rural population.

INTRODUCTION

Hepatitis B virus (HBV) infection remains a major global public health challenge, responsible for significant morbidity and mortality through its progression to chronic liver disease, cirrhosis, and hepatocellular carcinoma (HCC) (WHO) [1]. India is considered to lie in the intermediate endemicity zone, with HBV prevalence estimates in the general population ranging between 2% and 4% (or even up to 7% in older estimates) (e.g. India falls in the intermediate endemic hepatitis B zone with prevalence 2–7 %; ~50 million carriers) . A recent study also places India's HBsAg prevalence in the range of 3 %–4.2 % with ~40 million carriers[2,3] .

Because of this moderate endemicity, many HBV infections are asymptomatic, and undetected carriers may transmit infection in health care settings, including during invasive or surgical procedures. Hence, in a hospital environment, preoperative (pre-surgical) screening for HBsAg is considered beneficial to identify occult carriers and reduce nosocomial transmission risk (to health care workers and other patients) [4].

While multiple studies have examined HBV prevalence in community populations or high-risk groups (e.g., pregnant women, blood donors, healthcare workers), fewer studies focus on pre-surgical patients in rural settings, especially in India. For instance, in a meta-analysis among pregnant women in India, the pooled HBsAg prevalence was 1.6 % (95 % CI 1.4–1.8 %) [5-7] . In another Indian hospital-based screening over 72,400 individuals undergoing various procedures or testing, HBV seroprevalence was 3.71 % and HCV 1.91 %, with HBV/HCV coinfection of 0.13 % (central India) . A systematic review of viral hepatitis in India reported that HBV prevalence across studied populations ranged broadly — from approximately 0.87 % to as high as 21.4 % depending on region and population group . Pooled analysis also suggests a 3% prevalence of HBV in India (95% CI ~2–4 %) . Among tribal populations, prevalence may be much higher — e.g., a meta-analysis showed 11.85 % among tribal groups vs 3.07 % in non-tribal groups in India[8-11] .

Thus, screening of pre-surgical patients offers a window into “hidden” HBV carriage in a health-seeking population, and such data help assess the burden and guide infection control practices and vaccination strategies. Given this background, we conducted a cross-sectional screening of 650 pre-surgical patients in a rural tertiary care hospital. The aim was to estimate the seroprevalence of HBsAg, examine demographic and departmental patterns, and identify coinfection rates with HCV and HIV where applicable.

MATERIAL AND METHODS

Study Design and Setting

A hospital-based retrospective cross-sectional study was conducted over a period of 12 months. The study population comprised all patients undergoing elective surgical procedures in the departments of General Surgery, Orthopaedics, ENT, and Ophthalmology.

Sample Size and Selection

A total of 650 preoperative patients of all age groups and both sexes were included.

Inclusion criteria : comprised patients admitted for elective surgical interventions who provided consent for serological screening.

Exclusion criteria: included patients with known HBV infection, those on antiviral therapy, and emergency or trauma cases where prior screening was not possible

Specimen Collection and Processing

Under aseptic precautions, 3 mL of venous blood was drawn from each participant using a sterile disposable syringe. Samples were allowed to clot at room temperature and centrifuged at 3,000 rpm for 10 minutes to obtain clear serum. Each serum sample was tested for the presence of hepatitis B surface antigen (HBsAg) using a rapid immunochromatographic test kit (HEPACARD, J. Mitra & Co. Pvt Ltd., India), which functions on the antigen-capture “sandwich” principle (6–8).

The test kit utilizes monoclonal anti-HBsAg conjugated colloidal gold particles that react with HBsAg, if present, to form an antigen–antibody complex. The complex migrates through the membrane and binds to immobilized monoclonal anti-HBsAg antibodies in the test line, producing a pink-purple band. A second control band serves as an internal procedural control.

Positive result: Two bands (test + control).

Negative result: Only the control band appears.

Invalid result: Absence of control band; the test repeated with a new device (7,8).

For reactive samples, confirmatory testing by enzyme-linked immunosorbent assay (ELISA) was recommended and documented where available. Sera from positive individuals were further screened for HCV and HIV antibodies using rapid immunochromatographic tests (HCV Tri-Dot and HIV Triline, J. Mitra & Co., India) (9,10).

Objectives:

1. To assess the seroprevalence of HBsAg among patients presenting for elective surgical procedures.
2. To analyze seropositivity in relation to age, gender, department, and sociodemographic factors.
3. To assess coinfection rates with HCV and HIV among HBsAg-positive individuals.
4. To discuss implications for hospital policy, screening strategy, and preventive interventions.

Statistical Analysis

All data were entered in Microsoft Excel 2021 and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics were used to calculate frequencies and percentages. The Chi-square test (χ^2) was applied to evaluate associations between categorical variables such as age, gender, and departmental distribution. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 650 pre-surgical patients undergoing elective surgery were screened for HBsAg using a rapid immunochromatographic test. Among them, 14 (2.15%) were found to be seropositive for HBsAg, while 636 (97.85%) were negative (Figure 1).

Figure 1. Distribution of positive cases among the total tested for HBsAg

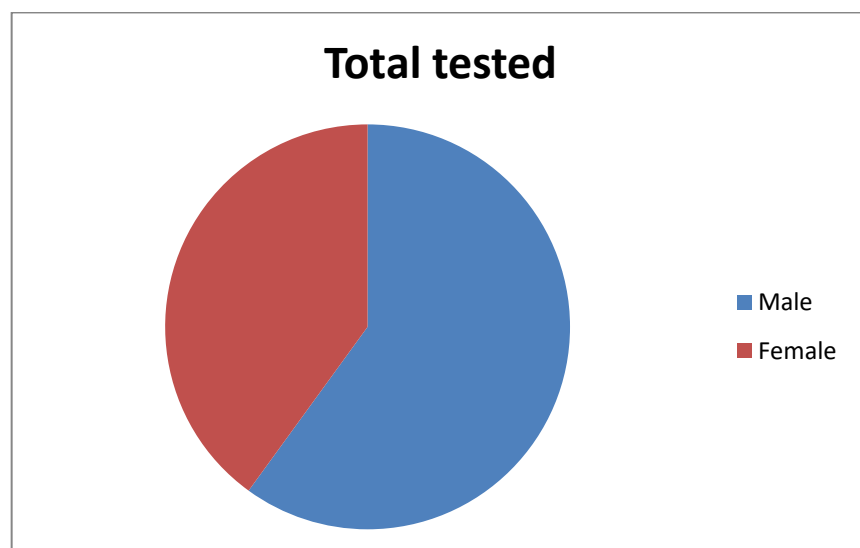
(Positive – 14, 2.15%; Negative – 636, 97.85%)

Gender-wise Distribution

Out of 14 positive cases, 10 were males and 4 were females. The male-to-female ratio was 2.5:1. The seroprevalence among males was 2.6%, while among females it was 1.4%, and this difference was statistically significant ($p = 0.03$).

Table 1. Gender-wise seroprevalence of HBsAg

GENDER	TOTAL TESTED	POSITIVE	PERCENTAGE POSITIVE
Male	390	10	2.6%
Female	260	4	1.4%
TOTAL	650	14	2.15%



Graph No. 1: Graphical representation of Genderwise distribution of cases

Age-wise Distribution

Maximum seropositivity was found in the 21–40 years age group (36%), followed by 41–60 years (29%), >60 years (21%), and 0–20 years (14%). The difference between age groups was statistically significant ($p = 0.04$).

Table 2. Age distribution among seropositive patients

Age Group (years)	Positive Cases (n= 14)	Percentage
0-20	2	14%
21-40	5	36%
41-60	4	29%
More than 60	3	21%
Total	14	100%

Department-wise Distribution

Most of the reactive patients were admitted under General Surgery (35.7%), followed by Orthopaedics (28.6%), ENT (21.4%), and Ophthalmology (14.3%). The departmental distribution did not show a statistically significant difference ($p > 0.05$).

Table 3. Distribution of patients according to department

Department	HBsAg	Percentage
General Surgery	5	35.7%
Orthopaedics	4	28.6%
ENT	3	21.4%
Ophthalmology	2	14.3%
Total	14	100%

Infection Type	Male	female	Total	Percentage
HBC only	9	4	13	92.9%
HBV + HCV	1	0	1	7.1%
HBV +HIV	0	0	0	0%

Sociodemographic Factors

Among the seropositive patients, the majority were married (71%), illiterate (36%), and agricultural workers (57%). Most of the female seropositive patients were homemakers. However, no statistically significant correlation was found between HBsAg positivity and these sociodemographic parameters ($p > 0.05$).

Coinfections

Of the 14 HBsAg-positive patients, one (7.1%) was also reactive for HCV, while none tested positive for HIV. The patient with HCV co-infection had a prior history of multiple blood transfusions.

DISCUSSION

In the present study involving 650 pre-surgical patients, the seroprevalence of HBsAg was 2.15%, which places this population in the intermediate endemic zone as per WHO classification (1,4). This finding aligns with national averages reported across India, where HBsAg prevalence in the general population varies between 2% and 4% (2,5,17).

Our observed prevalence is comparable to results from other hospital-based studies in India. Nahvi and Farooq (7) reported a prevalence of 1.88% among surgical patients in North India, while Mohan et al. (9) found 2.09% in a similar population. A South Indian study by Vazhavandan et al. (8) documented 1.61%, whereas Kayali et al. (18) reported 2.6% among 25,978 preoperative cases. In contrast, Taye et al. (6) observed a much higher prevalence of 9% in Ethiopian surgical candidates, highlighting the regional variability of HBV infection.

Gender Distribution

In this study, seroprevalence among males (2.6%) was higher than among females (1.4%), a finding consistent with multiple previous reports (9,11,12,13). Higher male prevalence has been attributed to greater occupational exposure, higher mobility, and behavioral risk factors such as unsafe injections, tattooing, and multiple sexual partners (10,11,12). Khatoon and Jahan (11) also reported 73% male positivity compared to 27% female, comparable to our 2.5:1 ratio.

Age-wise Distribution

Maximum HBsAg positivity occurred in the 21–40 year age group (36%), followed by 41–60 years (29%). Similar observations were reported by Kanodia et al. (12) and Atray et al. (13), who found clustering of cases in young adults due to increased social and occupational exposures. This working-age group represents the economically productive section of society, making HBV infection a public health burden due to potential long-term sequelae such as cirrhosis and hepatocellular carcinoma (3,5,17).

Departmental and Sociodemographic Distribution

Most seropositive patients were admitted under General Surgery (35.7%), followed by Orthopaedics (28.6%) and ENT (21.4%). This pattern reflects patient volume rather than any department-specific risk, similar to earlier findings (8,9). The majority of seropositive individuals were married, illiterate, and engaged in agricultural occupations—trends consistent with previous rural Indian studies (11,16). Illiteracy and limited awareness are known risk enhancers for parenteral infections, leading to unsafe injection practices and reduced vaccination uptake (17).

Coinfections

Among 14 HBsAg-positive patients, one (7.1%) was co-infected with HCV, while none were HIV positive. This is consistent with reports by Nahvi et al. (7) and Corcorran & Kim (14), who noted 0.3–1% HBV–HCV coinfection in Indian surgical settings. The absence of HIV coinfection aligns with global data suggesting lower HIV–HBV coinfection in general populations (14). Both HBV

and HCV share common transmission routes, including transfusion of unscreened blood and unsafe injections (6,14,15).

Comparison with Other Indian Data

Hospital-based seroprevalence across India typically ranges from 1.5%–3%, depending on geography and population type (7–9,11–13,16). For instance, Yadav et al. (16) reported 2.2% HBsAg positivity among preoperative patients in Central India, closely resembling our result (2.15%). Kalghatgi et al. (17) in their national review emphasized that although India is in the intermediate endemicity zone, regional micro-variations persist because of vaccination disparities and healthcare access differences.

Public Health Implications

Hepatitis B remains a “silent infection” due to its frequent asymptomatic nature and high transmissibility—even through minute blood exposure (4,15). Screening before surgery is essential to protect healthcare workers and other patients from occupational and nosocomial exposure (15). Vaccination remains the most effective preventive strategy (2,17). With global targets set to eliminate HBV as a public health threat by 2030 (1,5), routine preoperative screening and strengthening vaccination in rural populations are vital steps toward that goal.

CONCLUSION

In this cross-sectional screening of 650 elective surgical patients at a rural tertiary hospital, we found HBsAg seroprevalence of 2.15 %. Seropositivity was higher among males and more common in the 21–40 year age group. A small proportion (7.1 %) had HCV coinfection, while no HIV coinfection was detected.

These findings underscore that even in seemingly low-risk hospital populations, a measurable burden of asymptomatic HBV carriage exists. Therefore, mandatory preoperative HBV screening (at least in moderate-to-high endemic settings) is advisable for early detection, infection control, and linkage to care. Strengthening HBV vaccination coverage, especially in rural and less-educated communities, along with periodic surveillance studies using sensitive assays, are imperative to reduce the hidden reservoir and ultimately control HBV transmission in India.

Limitations of the study

1. Use of a rapid immunochromatographic assay rather than more sensitive ELISA or nucleic acid testing may result in under-detection of low-level infections.
2. Sample size (650) is moderate: with 14 positives, further subgroup analyses (e.g. risk factor associations) may lack statistical power.
3. It's a cross-sectional, hospital-based design, so not fully generalizable to the community.
4. Incomplete data on risk factors (e.g. history of transfusion, injecting drug use) may limit causal inferences.
5. Lack of follow-up to confirm chronicity (HBsAg persistence) or viral load.

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.

REFERENCES

1. World Health Organization. Hepatitis B. Fact Sheet. Geneva: WHO; 2024. Available from: <https://www.who.int/news-room/fact-sheets/detail/hepatitis-b>

2. Singhal V, Bora D, Singh S. Hepatitis B in healthcare workers: Indian scenario. *J Lab Physicians*. 2009;1(2):41–8.
3. Lok AS, McMahon BJ. Chronic hepatitis B. *Hepatology*. 2007;45(2):507–39.
4. Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. *J Viral Hepat*. 2004;11(2):97–107.
5. Nguyen MH, Wong G, Gane E, Kao JH, Dusheiko G. Hepatitis B virus: advances in prevention, diagnosis, and therapy. *Clin Microbiol Rev*. 2020;33(2):e00046–19.
6. Taye M, Daka D, Amsalu A, Hussien S. Magnitude of hepatitis B and C virus infections and associated factors among patients scheduled for surgery at Hawassa University, Ethiopia. *BMC Res Notes*. 2019;12(1):412.
7. Nahvi N, Farooq S. Seroprevalence of hepatitis B, hepatitis C, and HIV in patients undergoing surgery in a tertiary care hospital in North India. *Clin Epidemiol Glob Health*. 2020;8(1):45–8.
8. Vazhavandan G, Rajendran R, Shanmugam R. Seroprevalence of hepatitis B virus among patients at a rural tertiary healthcare center in South India: a four-year study. *Int J Res Med Sci*. 2017;2(1):310–3.
9. Mohan M, Sharma M, Pandey CP, Agarwal A. Preoperative screening of HIV, HBV, and HCV essential for surgical teams and patients. *Int J Contemp Med Res*. 2018;5(1):22–5.
10. Jain P, Prakash S, Gupta S, et al. Prevalence of hepatitis A, B, C, D, and E viruses in acute viral hepatitis in North India. *Indian J Med Microbiol*. 2013;31(3):261–5.
11. Khatoon R, Jahan N. Evaluation of seroprevalence of hepatitis B virus infection among patients attending a hospital of semi-urban North India using rapid immunoassay test. *Niger Postgrad Med J*. 2016;23(4):209–14.
12. Kanodia V, Yadav M, Maheshwari RK, Singh SK. Seroprevalence of hepatitis B surface antigen in a hospital-based population in Jaipur, Rajasthan. *MedPulse Int J Med*. 2015;2(3):123–5.
13. Atray D, Sharma A, Atray M. Seroprevalence of hepatitis B surface antigen in a hospital-based population in southern Rajasthan, India. *Int J Curr Microbiol Appl Sci*. 2016;5(6):466–9.
14. Corcorran MA, Kim N. Chronic hepatitis B and HIV coinfection. *Top Antivir Med*. 2023;31(1):14–22.
15. Deuffic-Burban S, Delarocque-Astagneau E, Abiteboul S, Bouvet E, Yazdanpanah Y. Blood-borne viruses in healthcare workers: prevention and management. *J Clin Virol*. 2011;52(1):4–10.
16. Yadav A, Shrivastava A, Tiwari A. Seroprevalence of hepatitis B virus infection among preoperative patients in Central India. *Indian J Pathol Microbiol*. 2022;65(3):559–64.
17. Kalghatgi AT, Sharma MK, et al. Epidemiology and prevention of hepatitis B in India. *Indian J Med Res*. 2021;154(5):590–602.
18. Kayalı S, Ari N, Akbulut A, Akbulut HH. Are preoperatively requested HBsAg results followed? *Viral Hepat J*. 2024;30(2):26–9.