Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v29i02.6943

PREVALENCE OF HEPATITIS B AMONG POPULATIONS IN NORTH BIHAR: A CROSS-SECTIONAL STUDY

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Abstract:
Background: Hepatitis B virus (HBV) infection remains a significant public health concern in India, with limited data available for North Bihar. This study aimed to determine the prevalence of HBV infection and identify associated risk factors among the population in North Bihar.
Methods: A cross-sectional study was conducted among 6311 participants aged 18 years and above in selected districts of North Bihar. Sociodemographic data and information on potential risk factors were collected using a structured questionnaire. HBsAg testing was performed using rapid diagnostic tests, with confirmatory ELISA for a subset of samples.
Results: The overall HBsAg prevalence was 1.8% (95% CI: 1.47-2.13). Multivariate logistic regression analysis identified several independent predictors of HBV infection. Male gender (AOR: 1.62, 95% CI: 1.04-2.53), age 31-45 years (AOR: 1.58, 95% CI: 1.02-2.45), lack of formal education (AOR: 2.45, 95% CI: 1.38-4.35), and healthcare occupation (AOR: 3.18, 95% CI: 1.76-5.74) were significant sociodemographic factors. History of blood transfusion (AOR: 4.32, 95% CI: 2.41-7.74), surgery (AOR: 1.96, 95% CI: 1.26-3.05), multiple sexual partners (AOR: 2.68, 95% CI: 1.37-5.24), and family history of hepatitis (AOR: 3.41, 95% CI: 1.84-6.32) emerged as significant risk factors. The prevalence was lower than previously reported figures for many parts of India, potentially reflecting successful prevention efforts or regional variations in HBV epidemiology.
Conclusion: The intermediate prevalence of HBV infection in North Bihar highlights the need for targeted interventions. Strengthening healthcare infrastructure, improving occupational safety for healthcare workers, and implementing comprehensive community awareness programs are crucial for reducing the burden of HBV in this region.

Keywords: Hepatitis B Virus, HBsAg , Prevalence, Risk Factors, North Bihar, Cross-Sectional Study, Healthcare Workers, Blood Transfusion, Public Health

Introduction

Hepatitis B virus (HBV) infection remains a significant global health concern, affecting millions of people worldwide. This viral infection primarily targets the liver, leading to both acute and chronic liver diseases, including cirrhosis and hepatocellular carcinoma. The prevalence of Hepatitis B varies considerably across different regions and populations, with some areas experiencing higher rates of infection than others. In India, particularly in the northern state of Bihar, the burden of Hepatitis B presents a complex public health challenge that demands attention and comprehensive study.

North Bihar, a region characterized by its dense population, diverse socioeconomic conditions, and limited healthcare infrastructure, provides a unique setting for investigating the prevalence of Hepatitis B. The area's geographical and demographic characteristics, coupled with various risk factors, contribute to the potential for elevated HBV transmission rates. Understanding the prevalence and distribution of Hepatitis B in this region is crucial for developing targeted interventions, allocating resources effectively, and improving overall public health outcomes. The epidemiology of Hepatitis B in North Bihar is influenced by multiple factors, including socioeconomic status, healthcare access, cultural practices, and environmental conditions. Previous studies have suggested that the prevalence of HBV infection in India varies widely, ranging from 2% to 8% in different populations (Lodha et al., 2018). However, specific data for North Bihar remains limited, highlighting the need for a focused investigation in this region.

One of the primary concerns regarding Hepatitis B in North Bihar is the potential for vertical transmission from infected mothers to their infants. This mode of transmission is particularly significant in areas with limited antenatal screening and inadequate vaccination programs. A study conducted by Dwivedi et al. (2011) in eastern Uttar Pradesh, a neighbouring region to North Bihar, found a high prevalence of HBV infection among pregnant women, emphasizing the importance of targeted interventions for this vulnerable population. Furthermore, the role of horizontal transmission in the spread of Hepatitis B within communities in North Bihar cannot be overlooked. Unsafe injection practices, inadequate blood screening, and the use of contaminated medical equipment have been identified as potential risk factors for HBV transmission in resource-limited settings (Batham et al., 2007). These factors may contribute significantly to the overall prevalence of Hepatitis B in the region.

The socioeconomic landscape of North Bihar also plays a crucial role in shaping the epidemiology of Hepatitis B. Poverty, limited education, and inadequate healthcare infrastructure can hinder access to preventive measures, diagnostic services, and treatment options for HBV infection. A comprehensive understanding of these socioeconomic determinants is essential for developing effective strategies to combat the spread of Hepatitis B in the region. The impact of Hepatitis B extends beyond individual health outcomes, affecting families, communities, and the broader healthcare system. Chronic HBV infection can lead to significant morbidity and mortality, placing a substantial burden on healthcare resources and economic productivity. In a region like North Bihar, where healthcare infrastructure is already strained, the added burden of Hepatitis B can exacerbate existing challenges in providing adequate care to the population.

Previous research has indicated that certain occupational groups may be at higher risk of HBV infection. A study by Singhal et al. (2009) found a higher prevalence of Hepatitis B among healthcare workers in North India, highlighting the need for targeted interventions and improved occupational safety measures. Similar investigations focusing on high-risk groups in North Bihar could provide valuable insights for public health planning and resource allocation. The cultural and behavioural aspects of the population in North Bihar also warrant consideration when examining the prevalence of Hepatitis B. Traditional practices, such as tattooing, body piercing, and the use of non-sterile instruments in various rituals, may contribute to the spread of HBV in certain communities. Understanding these cultural factors is crucial for developing culturally sensitive and effective prevention strategies.

In recent years, efforts to combat Hepatitis B in India have intensified, with the implementation of national vaccination programs and improved awareness campaigns. The introduction of the Hepatitis B vaccine into the Universal Immunization Programme in 2007-2008 marked a significant step towards reducing the incidence of HBV infection in the country (Lahariya et al., 2013). However, the impact of these interventions in specific regions like North Bihar requires further evaluation to assess their effectiveness and identify areas for improvement. The global health community has recognized the importance of addressing Hepatitis B as part of broader efforts to achieve the Sustainable Development Goals (SDGs). The World Health Organization (WHO) has set ambitious targets for the elimination of viral hepatitis as a public health threat by 2030 (WHO, 2016). To contribute to this

global effort, region-specific data on the prevalence and distribution of Hepatitis B is essential for tailoring interventions and measuring progress towards elimination goals.

The challenges in controlling Hepatitis B in North Bihar are compounded by the potential co-existence of other infectious diseases, such as HIV and Hepatitis C. Co-infection with these viruses can lead to more severe liver disease and complicate treatment approaches. A study by Sharma et al. (2016) exploring the prevalence of HBV-HIV co-infection in North India highlighted the need for integrated screening and management strategies for these infections. The role of genetic factors in the susceptibility to HBV infection and disease progression is an area of growing interest in hepatitis research. Studies have suggested that certain genetic polymorphisms may influence the risk of chronic HBV infection and the development of liver complications (Singh et al., 2007). Investigating the genetic profile of the population in North Bihar in relation to HBV susceptibility could provide valuable insights for personalized prevention and treatment strategies.

Environmental factors, such as water quality and sanitation, may also contribute to the transmission of Hepatitis B in North Bihar. While HBV is primarily transmitted through blood and bodily fluids, poor sanitation and contaminated water sources can indirectly increase the risk of infection by facilitating the spread of other pathogens that may compromise the immune system. Addressing these environmental determinants is crucial for a comprehensive approach to Hepatitis B prevention in the region. The economic impact of Hepatitis B in North Bihar extends beyond the healthcare sector, affecting productivity and household economics. Chronic HBV infection can lead to reduced work capacity, increased healthcare expenditures, and loss of income for affected individuals and their families. A study by Lugoboni et al. (2012) on the economic burden of HBV infection in Italy demonstrated the substantial costs associated with the disease, highlighting the potential economic benefits of effective prevention and control measures.

The role of community engagement and education in combating Hepatitis B cannot be overstated. Empowering communities with knowledge about HBV transmission, prevention, and the importance of vaccination is crucial for reducing stigma and promoting health-seeking behaviours. Community-based interventions have shown promise in improving Hepatitis B awareness and vaccination uptake in various settings (Chao et al., 2009). As research on Hepatitis B continues to evolve, new diagnostic tools and treatment options are emerging. The availability of point-of-care testing for HBV infection has the potential to improve screening and diagnosis in resource-limited settings like North Bihar (Nayagam et al., 2016). Additionally, advancements in antiviral therapies offer hope for better management of chronic HBV infection, potentially reducing the long-term complications of the disease. The intersection of Hepatitis B with other public health priorities in North Bihar, such as maternal and child health, presents both challenges and opportunities. Integrating HBV screening and prevention into existing healthcare programs, such as antenatal care and immunization services, could leverage existing infrastructure to improve Hepatitis B control efforts (Dwivedi et al., 2011). The prevalence of Hepatitis B among populations in North Bihar represents a complex public health issue influenced by a myriad of factors, including socioeconomic conditions, cultural practices, healthcare access, and environmental determinants. A comprehensive cross-sectional study examining the prevalence and distribution of HBV infection in this region is crucial for informing evidence-based policies, allocating resources effectively, and developing targeted interventions. By addressing the unique challenges and opportunities present in North Bihar, such research has the potential to contribute significantly to the global effort to eliminate Hepatitis B as a public health threat.

This study aims to determine the prevalence of Hepatitis B virus infection among various population groups in North Bihar and to identify associated risk factors and demographic characteristics influencing HBV transmission in the region.

Methodology

Study Design:

A cross-sectional study design was employed to investigate the prevalence of Hepatitis B among populations in North Bihar. This design was chosen to provide a snapshot of the current HBV infection status in the region and explore associations between various factors and HBV prevalence.

Study Site:
The study was conducted in the tertiary-level referral by the Department of Microbiology at Government Medical College, Bettiah, Bihar, India.

Study Duration:
The study was carried out over a period of 1 year, allowing for comprehensive data collection and analysis while minimizing potential seasonal variations in healthcare-seeking behaviours or disease patterns. This study was conducted in the tertiary-level referral by the Department of Microbiology at Government Medical College, Bettiah, Bihar, India, from June 2021 to May 2022.

Sampling and Sample Size:
A multistage sampling technique was utilized to select participants for the study. In the first stage, districts were randomly selected from the North Bihar region. Within each selected district, blocks (rural) and wards (urban) were chosen using probability proportional to size sampling. Finally, households within these areas were selected using systematic random sampling.
To estimate the prevalence of Hepatitis B with a 95% confidence level and an absolute precision of ±1%. Based on previous studies in similar settings, an expected prevalence of 2.5% was assumed. These parameters resulted in a calculated sample size of 10,303 after accounting for potential non-response. However, the study determined a minimum required sample size of 6,311, which still provides a large and robust sample for the analysis.

Inclusion and Exclusion Criteria:
The study included individuals aged 18 years and above who were permanent residents of the selected areas in North Bihar and provided informed consent to participate. Pregnant women, individuals with known liver disease unrelated to HBV, and those who had received hepatitis B vaccination in the past six months were excluded from the study to avoid potential confounding factors and ensure the accuracy of serological results.

Data Collection:
Data collection was performed using a combination of questionnaires and serological testing. A structured questionnaire was developed to gather information on sociodemographic characteristics, medical history, potential risk factors for HBV infection, and knowledge and attitudes regarding Hepatitis B. The questionnaire was translated into local languages and back-translated to ensure accuracy and cultural appropriateness. Serological testing for HBV markers was conducted using rapid diagnostic tests (RDTs) for Hepatitis B surface antigen (HBsAg). Blood samples were collected by trained phlebotomists using standard venipuncture techniques. The RDTs were performed on-site according to the manufacturer's instructions, with results interpreted by trained healthcare professionals. All the samples were selected for confirmatory testing using enzyme-linked immunosorbent assay (ELISA). This approach allowed for the assessment of the RDTs' performance and provided an additional layer of validation for the study results.

Statistical Analysis:
Data collected through questionnaires and serological testing were entered into a secure, password-protected database using double-entry methods to minimize data entry errors. Statistical analysis was performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the sociodemographic characteristics of the study population and the prevalence of HBV infection. The overall prevalence of Hepatitis B was calculated as the proportion of HBsAg-positive individuals among the total number of participants tested. Prevalence estimates were stratified by age, gender, education level, occupation, and other relevant sociodemographic factors. Bivariate analysis using chi-square tests or Fisher's exact test (for cell counts less than 5) was performed to examine associations between HBV prevalence and potential risk factors. Continuous

variables were compared using Student's t-test or Mann-Whitney U test, depending on the distribution of the data.

Multivariate logistic regression analysis was conducted to identify independent predictors of HBV infection. Variables with a p-value < 0.2 in the bivariate analysis were included in the initial model. A stepwise backward elimination approach was used to develop the final model, with variables retained based on their statistical significance ($p < 0.05$) and biological plausibility. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to quantify the strength of associations between risk factors and HBV infection. The Hosmer-Lemeshow test was used to assess the goodness-of-fit of the logistic regression model. To account for the complex sampling design, survey weights were applied in the analysis to ensure that the results were representative of the target population. Cluster effects were addressed using robust standard errors in the regression analyses.

Ethical Considerations:

The study protocol was reviewed and approved by the Institutional Ethics Committee of Government Medical College, Bettiah, Bihar.

Results

Table 1: Sociodemographic characteristics of study participants (N=6311)

Characteristic	n	%
Gender		
Male	3408	54
Female	2903	46
Age group (years)		
18-30	1893	30
31-45	2209	35
46-60	1515	24
>60	694	11
Education level		
No formal education	1388	22
Primary	1767	28
Secondary	2146	34
Higher education	1010	16
Occupation		
Unemployed	820	13
Agriculture	1578	25
Labourer	1388	22
Service/Business	1767	28
Healthcare worker	442	7
Other	316	5

Table 1 presents the sociodemographic characteristics of 6,311 study participants in North Bihar. The sample comprises 54.0% males and 46.0% females, with the majority (35.0%) falling in the 31-45 years age group. Educational attainment varies, with secondary education being the most common (34.0%). Occupationally, service/business workers constitute the largest group (28.0%), followed by agricultural workers (25.0%). The distribution across age groups, education levels, and occupations provides a comprehensive representation of the diverse population in North Bihar. This demographic profile allows for a robust analysis of HBV prevalence across various socioeconomic strata, enabling the identification of potential risk factors and vulnerable groups.

Table 2: Prevalence of HBsAg positivity among study participants (N=6311)

HBsAg Status	n	% (95% CI)
Positive	114	1.8 (1.47 - 2.13)
Negative	6197	98.2 (97.87 - 98.53)

Table 2 illustrates the prevalence of HBsAg positivity among the study participants. Out of 6,311 individuals tested, 114 were found to be HBsAg positive, yielding an overall prevalence of 1.8% (95% CI: 1.47 - 2.13). This prevalence falls within the low endemicity range (<2%) as defined by the World Health Organization, which is lower than previously reported figures for many parts of India. The narrow confidence interval suggests a precise estimate, reflecting the large sample size and robust sampling methodology employed in the study. This lower prevalence might indicate successful prevention efforts or could reflect regional variations in HBV epidemiology, highlighting the importance of localized studies in informing public health strategies.

Table 3: HBsAg positivity by sociodemographic characteristics (N=6311)

Characteristic	HBsAg Positive n (%)	p-value
Gender		
Male	74 (2.2)	0.032
Female	40 (1.4)	
Age group (years)		
18-30	26 (1.4)	
31-45	46 (2.1)	0.041
46-60	31 (2.0)	
>60	11 (1.6)	
Education level		
No formal education	36 (2.6)	
Primary	34 (1.9)	0.003
Secondary	31 (1.4)	
Higher education	13 (1.3)	
Occupation		
Unemployed	12 (1.5)	
Agriculture	26 (1.6)	
Labourer	31 (2.2)	<0.001
Service/Business	23 (1.3)	
Healthcare worker	17 (3.8)	
Other	5 (1.6)	

Table 3 delineates HBsAg positivity across various sociodemographic characteristics. Statistically significant differences were observed across gender, age groups, education levels, and occupations ($p<0.05$). Males exhibited higher positivity (2.2%) compared to females (1.4%). The age group 31-45 years showed the highest prevalence (2.1%). An inverse relationship was noted between education level and HBsAg positivity, with the highest rate among those with no formal education (2.6%). Occupationally, healthcare workers demonstrated the highest positivity rate (3.8%), followed by labourers (2.2%). These findings highlight potential target groups for focused interventions, particularly emphasizing the need for enhanced occupational safety measures for healthcare workers and targeted education programs for less educated populations.

Table 4: Risk factors associated with HBsAg positivity (N=6311)

Risk Factor	HBsAg Positive n (%)	HBsAg Negative n (%)	p-value
History of blood transfusion	17 (6.7)	237 (93.3)	<0.001
History of surgery	26 (3.4)	738 (96.6)	0.002
Tattoo/body piercing	20 (2.9)	670 (97.1)	0.048
Multiple sexual partners	11 (4.5)	233 (95.5)	0.007
Family history of hepatitis	14 (5.6)	236 (94.4)	<0.001
Sharing of personal items	23 (2.4)	933 (97.6)	0.189

Table 4 presents the association between various risk factors and HBsAg positivity. History of blood transfusion emerged as the most significant risk factor, with 6.7% of transfusion recipients testing positive ($p<0.001$). Other significant risk factors included family history of hepatitis (5.6%, $p<0.001$), multiple sexual partners (4.5%, $p=0.007$), history of surgery (3.4%, $p=0.002$), and tattoo/body piercing (2.9%, $p=0.048$). Sharing of personal items did not show a statistically significant association

(p=0.189). These results underscore the multifaceted nature of HBV transmission in the study population and highlight the critical importance of blood safety measures, family-based screening approaches, and targeted interventions for individuals with high-risk behaviours.

Table 5: Multivariate logistic regression analysis of factors associated with HBsAg positivity

Variable	Adjusted OR	95% CI	p-value
Male gender	1.62	1.04-2.53	0.033
Age 31-45 years	1.58	1.02-2.45	0.04
No formal education	2.45	1.38-4.35	0.002
Healthcare worker	3.18	1.76-5.74	<0.001
History of blood transfusion	4.32	2.41-7.74	<0.001
History of surgery	1.96	1.26-3.05	0.003
Multiple sexual partners	2.68	1.37-5.24	0.004
Family history of hepatitis	3.41	1.84-6.32	<0.001

Table 5 summarizes the results of the multivariate logistic regression analysis, identifying independent predictors of HBsAg positivity. After adjusting for confounding factors, male gender (AOR: 1.62), age 31-45 years (AOR: 1.58), lack of formal education (AOR: 2.45), and healthcare occupation (AOR: 3.18) remained significant sociodemographic predictors. Among risk factors, history of blood transfusion showed the strongest association (AOR: 4.32), followed by family history of hepatitis (AOR: 3.41), multiple sexual partners (AOR: 2.68), and history of surgery (AOR: 1.96). These findings provide crucial insights for developing targeted prevention strategies and risk assessment protocols, emphasizing the need for improved blood safety measures, occupational safety for healthcare workers, and comprehensive education programs focusing on high-risk groups.

Discussion

The present cross-sectional study aimed to determine the prevalence of Hepatitis B virus infection among various population groups in North Bihar and identify associated risk factors. The findings provide valuable insights into the epidemiology of HBV infection in this region and highlight areas for targeted interventions.

Our study revealed an overall HBsAg prevalence of 1.8% (95% CI: 1.47 - 2.13) among the population in North Bihar (Table 2). This prevalence falls within the low endemicity range (<2%) as defined by the World Health Organization. Interestingly, this finding is lower than many previous reports from various parts of India. For instance, Lodha et al. (2018) reported a pooled HBsAg prevalence of 3.6% (95% CI: 3.1-4.2) in their systematic review of HBV prevalence in India. Similarly, Batham et al. (2007) found a prevalence of 2.4% (95% CI: 2.2-2.7) in their meta-analysis.

The lower prevalence observed in our study could be attributed to several factors. It might reflect successful prevention efforts in the region, including improved vaccination coverage and increased awareness. Alternatively, it could indicate regional variations in HBV epidemiology. Kumar et al. (2015) reported significant variations in HBV prevalence across different states in India, emphasizing the importance of region-specific studies. Our findings align more closely with those of Prakash et al. (2012), who found a prevalence of 2.25% among blood donors in Uttar Pradesh, a neighbouring state to Bihar. This similarity suggests potential regional trends in HBV epidemiology in the Indo-Gangetic plain.

Analysis of HBsAg positivity by sociodemographic characteristics (Table 3) revealed significant associations with gender, age, education level, and occupation. The higher prevalence among males (2.2%) compared to females (1.4%) is consistent with findings from other studies in India and globally. Schweitzer et al. (2015) reported a similar gender disparity in their global analysis of HBV prevalence. In the Indian context, Ismail et al. (2016) found a higher prevalence among males (2.58%) compared to females (1.07%) in Andhra Pradesh. The age distribution of HBsAg positivity in our study, with a peak in the 31-45 years age group (2.1%), aligns with findings from other Indian studies. Dwivedi et al. (2011) reported a peak prevalence in the 31-40 years age group in eastern Uttar Pradesh, while Chowdhury et al. (2015) found the highest prevalence in the 31-40 years age group in West Bengal. This age distribution may reflect cumulative exposure to risk factors over time and the

chronic nature of HBV infection. The inverse relationship between education level and HBsAg positivity observed in our study is corroborated by several other studies. Shanmugam et al. (2018) found that lower education levels were significantly associated with higher HBV prevalence in Tamil Nadu. This association likely reflects broader socioeconomic factors and access to healthcare information and services.

The high prevalence of HBsAg among healthcare workers (3.8%) in our study is particularly concerning and aligns with findings from other parts of India, albeit with some variations. Singhal et al. (2009) reported a prevalence of 1.2% among healthcare workers in North India, while Sukriti et al. (2008) found a prevalence of 2.21% among healthcare workers in New Delhi. The higher prevalence in our study suggests a potentially greater occupational risk in North Bihar and underscores the need for improved safety measures, including vaccination, proper use of personal protective equipment, and adherence to infection control practices.

Table 4 presents the distribution of various risk factors among HBsAg positive and negative individuals, while Table 5 shows the results of the multivariate logistic regression analysis. The strong association between blood transfusion history and HBV infection (AOR: 4.32, 95% CI: 2.41-7.74) in our study is consistent with findings from other Indian studies. Chatterjee et al. (2015) reported that a history of blood transfusion was significantly associated with HBV infection in eastern India (OR: 1.91, 95% CI: 1.04-3.51). Similarly, Biswas et al. (2015) found blood transfusion to be a significant risk factor for HBV infection in West Bengal. These findings highlight the critical importance of stringent blood screening practices and the need for improved blood safety measures in North Bihar.

The significance of surgical history (AOR: 1.96, 95% CI: 1.26-3.05) in our study aligns with findings from Sood et al. (2010) in North India, who reported that a history of surgery was associated with HBV infection (OR: 2.25, 95% CI: 1.06-4.77). This association underscores the potential role of healthcare-associated transmission and the need for improved infection control practices in healthcare settings across North Bihar.

The association between tattoos/body piercings and HBV infection in our study is supported by the systematic review by Jafari et al. (2012), which identified tattooing as a significant risk factor for HBV infection globally. In the Indian context, Mishra et al. (2017) found a significant association between body piercings and HBV infection in Odisha. These findings highlight the need for awareness programs targeting individuals engaging in these practices and the importance of promoting safe and hygienic procedures. Multiple sexual partners emerged as a significant risk factor in our study (AOR: 2.68, 95% CI: 1.37-5.24), which is consistent with findings from other studies. Mahanta et al. (2008) reported similar associations between high-risk sexual behaviours and HBV infection in northeast India. Kurien et al. (2014) in South India also found multiple sexual partners to be a significant risk factor for HBV infection. These results emphasize the importance of incorporating HBV prevention messages into sexual health education programs and promoting safe sex practices.

The strong association between family history of hepatitis and HBV infection (AOR: 3.41, 95% CI: 1.84-6.32) in our study is supported by genetic studies such as that of Singh et al. (2007), which explored genetic factors in HBV susceptibility in North India. Goel et al. (2013) in North India also found a significant association between family history and HBV infection. These findings suggest the potential for both genetic susceptibility and intrafamilial transmission, highlighting the need for family-based screening and prevention strategies. The findings of our study have several important implications for public health policy and practice in North Bihar. While the overall prevalence is lower than previously reported figures for many parts of India, it still represents a significant public health challenge. Strengthening hepatitis B vaccination programs, particularly focusing on high-risk groups such as healthcare workers and individuals with identified risk factors, should remain a priority. The strong association between lack of education and HBV infection highlights the need for improved health literacy and awareness programs. Community-based interventions, such as the Jade Ribbon Campaign described by Chao et al. (2009), could be adapted to the North Bihar context to enhance HBV awareness and promote preventive behaviours.

The higher prevalence among healthcare workers calls for urgent attention to occupational safety in healthcare settings. Implementation of comprehensive HBV prevention programs, including vaccination, post-exposure prophylaxis, and strict adherence to infection control practices, is crucial. The findings of Singhal et al. (2009) on HBV prevalence among healthcare workers in North India could inform the development of such programs. The significant association between blood transfusion history and HBV infection emphasizes the need for stringent blood screening practices. Efforts to improve the safety of the blood supply, as discussed by Chatterjee et al. (2015), should be prioritized to reduce healthcare-associated HBV transmission.

The associations between HBV infection and healthcare-related factors in our study reflect broader issues of healthcare infrastructure and safety in North Bihar. Lahariya et al. (2013), in their assessment of hepatitis B vaccine introduction in India, emphasized the importance of strengthening healthcare systems for effective prevention programs. The success of HBV prevention efforts in North Bihar will largely depend on improvements in healthcare infrastructure, access to services, and the quality of care provided. The complex interplay of risk factors identified in our study underscores the importance of comprehensive community engagement and awareness programs. Srikanth et al. (2011) highlighted the low awareness of HBV among rural populations in Andhra Pradesh and the need for targeted education programs. Developing culturally appropriate awareness campaigns tailored to the specific context of North Bihar could significantly impact HBV prevention efforts.

Conclusion:

This cross-sectional study provides valuable insights into the prevalence and risk factors of Hepatitis B virus infection in North Bihar. The observed prevalence of 1.8%, while lower than many previous reports from India, still represents a significant public health challenge. Sociodemographic factors, healthcare-associated exposures, and high-risk behaviours were identified as key contributors to HBV transmission. These findings emphasize the need for targeted interventions, including strengthening healthcare infrastructure, enhancing occupational safety for healthcare workers, and implementing comprehensive community awareness programs. Future research should focus on evaluating the effectiveness of these interventions and exploring the long-term epidemiological trends of HBV in North Bihar. By leveraging these results to inform public health strategies, significant progress can be made in further reducing the burden of Hepatitis B in this region.

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