

A STUDY OF SEROPREVALENCE AND PROBABLE RISK FACTORS OF HEPATITIS DELTA VIRUS IN HBSAG POSITIVE PATIENTS ADMITTED IN A TERTIARY CARE HOSPITAL IN MUMBAI

Virology

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ABSTRACT

Purpose: Chronic HBV carriers are at risk of infection with hepatitis delta virus (HDV) and it is known that concomitant infection with HDV tends to accelerate the progress of chronic HBV infection to chronic hepatitis, cirrhosis and HCC. HDV can present as co infection or super infection. This study will provide data for early recognition of coinfection and superinfection of Hepatitis D in HBsAg positive patients and analyze various variables like age, sex, risk factors in the same. **Methods:** The study was conducted in Grant Medical College and Sir JJ Group of Hospitals, Mumbai from November 2022 to April 2024. The data was retrieved directly from the HBsAg positive patients admitted in the ward and the medical records after obtaining their consent. **Results:** A total of 178 patients positive for HBsAg ELISA fulfilled inclusion criteria out of which 10 were positive for total HDV antibodies and 1 for anti- HBc IgM by ELISA testing. The seroprevalence of HDV among HBsAg positive cases attending a tertiary care hospital in Mumbai was 5.62%. **Conclusion:** The seroprevalence of HDV among HBsAg positive cases attending a tertiary care hospital in Mumbai was 5.62% with 1 case of co infection and 9 cases of super infection which shows a declining trend from previous studies conducted in the country .

KEYWORDS

Hepatitis D, Hepatitis B, Co infection, Superinfection

1. INTRODUCTION

Hepatitis B virus (HBV) is a prevalent public health problem in developing countries causing a million deaths annually.[1] About 350 million people worldwide have chronic Hepatitis B, which can progress to cirrhosis, liver failure, or hepatocellular carcinoma. HBV carriers are at risk of HDV (Hepatitis Delta Virus) coinfection, which accelerates progression to chronic hepatitis, cirrhosis, and HCC. (Hepatocellular Carcinoma) .[2]

Hepatitis D virus is a defective RNA virus which requires the presence of HBV for replication and propagation.[3]

There is a lack of national survey in India although a number of studies have estimated the prevalence of delta virus infection. In Manipur, according to a study done in 2022, the HDV prevalence was 4.2% in HBsAg positive patients.[4]

The modes of HDV transmission are similar to those of hepatitis B infection; blood borne and sexual, percutaneous[5] (intravenous drug abuse) with percutaneous exposure being the most common. Sexual transmission is less common than for HBV while perinatal acquisition is rare.

HDV causes acute and chronic liver inflammation. Its exact mechanism is unclear, but injury may result from direct cytotoxicity or immune-mediated damage. Cirrhosis risk is three times higher in HDV coinfection than in HBV alone, with increased progression to HCC.[6]

HDV can simultaneously infect a person with HBV (co - infection) or superinfect a person already infected with HBV (super - infection)[7]. Co infection ranges from mild to severe or fulminant hepatitis[8] with most being self limiting[9] and 20% cases progressing to cirrhosis. Super infection presents as exacerbation in previously asymptomatic chronic hepatitis B patients. Super infection is confirmed by positive HDV antibodies and negative IgM anti-HBc.

The most useful markers of HDV infection include Hepatitis D Ag, antibody to Hepatitis D Ag (anti - HDV IgM and IgG), HDV RNA and immuno histochemical staining of Hepatitis D antigen in liver tissue. The most readily available marker of HDV infection has been anti - HDV . Total anti-HDV IgM and IgG can be detected by commercially available radioimmunoassay (RIA) or enzyme-immunoassay (EIA).

2. MATERIALS AND METHODS

The study was a descriptive cross sectional study conducted in Grant

Medical College and Sir JJ Group of Hospitals, Mumbai from November 2022 to April 2024 with a total of 178 cases included. The data was retrieved directly from the HBsAg positive patients admitted in the ward and the medical records after obtaining their consent. All patients above 18 years of age were included and outpatient cases excluded. Samples run for HBsAg ELISA (qualitative), anti HDV Ab ELISA (qualitative), IgM anti HBc ELISA (qualitative and quantitative).

3. RESULTS

A total of 178 HBsAg ELISA positive cases were included in the study. This study was aimed to determine the total HDV antibodies in Hepatitis B positive patients and find the seroprevalence of Hepatitis D co infection and super infection in the same.

Table 1 shows the description of hepatitis D antibody positive cases. Out of 178 HBsAg positive cases, 10 were positive for total anti HDV antibodies, of which 1 was positive for IgM anti Hbc. The seroprevalence of co infection of hepatitis D to be 10% and superinfection of hepatitis D to be 90% in HBsAg positive cases in this study.

Table 1: Description of Hepatitis D Antibody Positive Cases

Age (yrs)	Gender	Total anti-HDV	Anti-HBc IgM	Associated risk factors	Family history of Hep B
45	F	POSITIVE	POSITIVE	CKD, TATTOO	No
22	M	POSITIVE	NEGATIVE	IDU	No
32	M	POSITIVE	NEGATIVE	CKD	No
30	F	POSITIVE	NEGATIVE		No
57	M	POSITIVE	NEGATIVE	MULTIPLE IMPRISONMENT, SURGERY	No
62	M	POSITIVE	NEGATIVE	SURGERY	No
56	M	POSITIVE	NEGATIVE	SURGERY	No
35	M	POSITIVE	NEGATIVE		No
49	M	POSITIVE	NEGATIVE	CKD	No
43	F	POSITIVE	NEGATIVE	SURGERY, FATTY LIVER	Yes

Only one case was positive for total anti-HDV as well as anti-HBc IgM

The concentration of IgM anti-HBc was 82 PEI U/ml as plotted in the chart in Figure 1

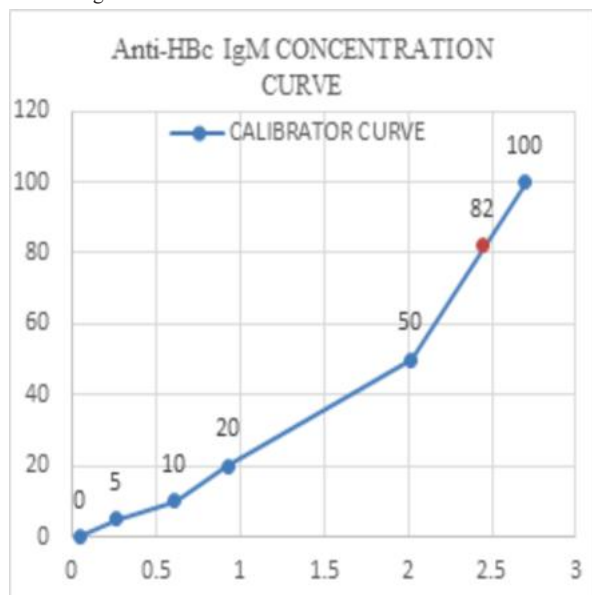


Figure 1 IgM Anti HBc Curve

Table 1 also shows the mean age of hepatitis D antibody positive cases in this study to be 43 years

Out of 9 patients that were undergoing regular dialysis for Chronic Kidney disease and were HBsAg positive, 3 of them were positive for hepatitis D antibody. There was significant association between presence of hepatitis D antibodies and dialysis risk factor in this study. Cases undergoing dialysis has 11 times more chance of acquiring hepatitis D than those not undergoing dialysis as shown in Table 2.

Table 2: Distribution of Hepatitis D Antibodies According to Risk Factors of Transmission

Characteristics		Hepatitis D Antibodies (N)		P value
		Positive	Negative	
IDU	Yes	1	3	0.208
	No	9	165	
Blood transfusion	Yes	0	8	NA
	No	10	160	
Dialysis	Yes	3	6	0.009 (Odds ratio – 11.7)
	No	7	162	
Tattoo	Yes	2	13	0.201
	No	8	155	
Needle prick	Yes	0	3	NA
	No	10	165	
HIV	Yes	2	4	NA
	No	10	164	
Surgical history	Yes	4	18	0.023 (Odds ratio-5.55)
	No	6	150	
?Sexual transmission	Yes	0	2	NA
	No	10	165	

Out of 22 HBsAg positive cases that underwent prior surgeries, 4 showed presence of antibodies to hepatitis D. There was a significant association between presence of hepatitis D antibodies with a previous history of surgery in this study. The odds of antibodies to hepatitis D in patients with a prior surgical history is 5 times more than in patients without any such history as shown in Table 2.

No significant association of HDV was found with IDU, HIV, needle prick, tattoo history, sexual transmission and blood transfusion in this study.

Hepatitis D antibodies were present in 7 (0.7%) out of 127 HBsAg positive male cases and 3 (0.3%) out of 51 HBsAg positive female cases.

Table 3 shows seroprevalence of hepatitis D in different studies in India.

Table 3: Seroprevalence of Hepatitis D in Different Studies in India.

Study	Publication Year	HBsAg + Cases	Hep D Ab + Cases
Banker et al[10]	1992	331	124(37.4)
Amarapurkar et al[16]	1992	254	44(17.3)
Chakraborty et al[12]	2005	123	13(10.6)
Saravanan et al[13]	2008	153	9(5.9)
Shah et al[14]	2012	141	12(8.5)
Chakraborty et al[15]	2015	100	2(2)
Patel et al[18]	2016	150	0(0)
Sharma KT et al[4]	2022	119	5(4.2)
Present study	2022-2023 (Conducted)	178	10(5.62)

Table 4 shows biochemical parameters - Aspartate transaminase, Alanine transaminase, Prothrombin time and International Normalised Ratio in Hepatitis D antibody positive cases. The standard ranges being shown in brackets

Table 4: Description of Biochemical Parameters with Hepatitis D Antibody

Age (yrs)	Gender	Total anti-HDV	Anti-HBc IgM	AST (8 to 48 U/L)	ALT (7 to 55 U/L)	PT (9.4-12.5 sec)	INR (<1.1)
45	F	POSITIVE	POSITIVE	50	45	15	1.12
22	M	POSITIVE	NEGATIVE	40	38	12.5	0.92
32	M	POSITIVE	NEGATIVE	42	30	25.4	1.73
30	F	POSITIVE	NEGATIVE	42	30	11.5	0.9
57	M	POSITIVE	NEGATIVE	38	30	12	0.88
62	M	POSITIVE	NEGATIVE	42	38	13.5	0.93
56	M	POSITIVE	NEGATIVE	35	23	14	1.1
35	M	POSITIVE	NEGATIVE	34	28	11	0.92
49	M	POSITIVE	NEGATIVE	58.5	31	15	1.25
43	F	POSITIVE	NEGATIVE	24	23	11.4	1.03

4. DISCUSSION

In this study, the seroprevalence of Hepatitis D Virus (HDV) was determined to be 5.62%. There has been a significant decline in seroprevalence of Hepatitis D Virus (HDV) over the years. This observation is supported by various national studies that have been considered for comparative analysis. A landmark study conducted by Banker et al.[10] in 1992 reported an HDV prevalence rate of 37.46% among HBsAg-positive patients in Mumbai. This figure from the early 1990s highlights how widespread HDV infection was in that particular population at that time. Bhattacharya et al. conducted a study in 1998, which revealed that the prevalence of Hepatitis D Virus (HDV) in Kolkata was 3.3%.[11] This study provided insights into the regional distribution of HDV during that period. Several years later, Chakraborty et al. carried out a study in 2005 in New Delhi, where they found the prevalence to be higher at 10.6%, indicating a significant variation in HDV infection rates between different geographic regions within India.[14] Saravanan et al. conducted a study in Chennai in 2008, where they evaluated the seroprevalence of HDV among 153 individuals with HBV-related liver disease, finding a prevalence rate of 5.9%.[13] These studies highlight the varied epidemiology of HDV across Indian cities and time periods, emphasizing the need for regional research to understand its distribution and impact. The decline may be due to improved healthcare access, better diagnostics and treatment, and widespread Hepatitis B vaccination, which indirectly reduces HDV prevalence.

In this study, HDV prevalence was higher in males than females, though not significantly. This contrasts with Sharma KT et al. in Manipur [4], who reported equal prevalence in both sexes. The difference may reflect variations in social dynamics and healthcare access.

In this study, HDV seroprevalence was highest in those over 40 years (60%), suggesting greater vulnerability in older adults. This contrasts with Shah et al. and Murhekar et al., who reported peak prevalence in the 31–40 age group.[14,15] The age difference may reflect varying exposure and risk patterns. Higher prevalence above 40 years could relate to healthcare access, vaccination status, or age-related behavioral risks. These findings stress the need for age-specific strategies and continued surveillance to understand HDV risk across populations and time.

Hepatitis D antibodies were detected in 1 individual out of the 4 intravenous (IV) drug abusers who were tested. The higher prevalence among IV drug users reflects increased risk from needle sharing and blood-borne transmission. Among non-IDUs, 9 of 174 were HDV-positive, showing much lower seroprevalence. Although no significant association was found between Hepatitis D antibodies and IDU, targeted interventions, including harm reduction strategies and increased screening efforts, to address the risks faced by IV drug users and to reduce the spread of HDV within this high-risk population can be practiced.

None of the cases had a history of blood transfusion, suggesting it was not a risk factor. However, 3 patients on regular dialysis were HDV-positive, showing a significant association and possible risk from repeated blood exposure or shared equipment. Two participants with tattoos also tested positive, indicating potential risk from poor sterilization, though no significant association was found.

Moreover, 4 individuals who had undergone surgical procedures in the past were found to have Hepatitis D antibodies indicating significant association, suggesting that their exposure to the virus might have occurred during these medical interventions. The presence of Hepatitis D antibodies in these cases underscores the need for stringent infection control measures in medical and non-medical settings alike to minimize the risk of HDV transmission. This data emphasizes the importance of careful screening and monitoring of at-risk groups, such as those undergoing dialysis or surgical procedures, to prevent the spread of Hepatitis D.

In this study, none of the HDV-positive patients reported HIV infection, sexual exposure, or needle-stick injury—common transmission routes—suggesting other modes of transmission may be more relevant in this population.

The study did, however, reveal a significant association between the presence of HDV antibodies and specific medical histories, particularly in patients who had undergone dialysis or previous surgical procedures. This suggests that these medical interventions may have played a critical role in the transmission of HDV, potentially due to exposure to contaminated equipment or environments where strict sterilization protocols may not have been fully adhered to.

Biochemical parameters of most of the cases were within acceptable ranges and no significant association to severity could be made.

5. CONCLUSION

5.1 The seroprevalence in this study is 5.62% and is of low endemicity.

5.2 Seroprevalence of co-infection was 0.56% and super-infection was 5.05%.

5.3 HDV seroprevalence remains higher in high-risk groups, including older adults and those undergoing dialysis or surgery. Despite declining overall prevalence, targeted interventions and strict infection control are needed, as superinfection increases the risk of fulminant hepatitis and rapid progression to cirrhosis.

5.4 The study also highlights the lack of significant associations between HDV infection and other variables such as age, sex, history of HIV, blood transfusions, tattooing, and certain high-risk behaviours, suggesting that the primary routes of HDV transmission in this population may differ from those commonly recognized.

5.5 Biochemical parameters must be paired with radiological and histopathological findings to comment upon severity.

5.6 No significant association was found between HDV antibodies and demographic or behavioral factors such as age, sex, IDU, transfusion, tattooing, needle injury, HIV status, or multiple partners. Risk was mainly linked to dialysis and surgical history, highlighting the need for strict infection control in medical settings.

6. Declaration (Ethical Approval): Approval from the Institutional Ethics Committee (IEC), Sir JJ group of Hospitals, Mumbai was taken under letter No. IEC/PG/925/Sep/2022 dated 27 September 2022.

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