

Original Research Article

Trends in seroprevalence of enteric transmitted hepatitis virus infections at a tertiary care hospital in Delhi: a 4-year review

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ABSTRACT

Background: Hepatitis A virus (HAV) and hepatitis E virus (HEV), both enteric hepatitis viruses, are transmitted through the feco-oral route. These infections can range from asymptomatic or subclinical cases to acute viral hepatitis, occasionally leading to mortality. To gain an understanding of the disease and develop effective management strategies, comprehending the disease burden is essential. This study aimed to provide insights into the prevalence of enteric transmitted hepatitis viruses among individuals with acute hepatitis in the Delhi region.

Methods: A retrospective investigation was conducted at a prominent tertiary care super specialty hospital in Delhi, spanning from February 2019 to December 2022. Serum samples from patients suspected of having hepatitis and sent for HAV and HEV testing were included. The samples underwent enzyme-linked immunosorbent assay to detect HAV and HEV immunoglobulin (Ig)M antibodies. Collected data was analyzed using SPSS software version 21, employing Chi-square and Fischer exact tests where applicable.

Results: Throughout the study period, a total of 1275 samples were incorporated. Viral etiology was evident in 197 patients (15.45%). Among these, IgM HAV was identified in 142 patients (11.13%), and IgM HEV was present in 55 patients (4.31%). HAV infection was notably more prevalent in the pediatric age group (20.89% or 89/426; $p < 0.001$), while HEV was significantly more common among adolescents and adults (5.77% or 49/849; $p < 0.001$).

Conclusions: Regular surveillance of enteric transmitted viruses causing hepatitis should encompass both hospital and community levels to accurately gauge disease burden and evolving epidemiology.

Keywords: Acute virus hepatitis, Hepatitis A, Hepatitis E, Seroprevalence

INTRODUCTION

In 2019, the World Health Organization (WHO) estimated that over 100 million cases of hepatitis A virus infections occurred globally, resulting in approximately 1.5 million clinical cases each year, along with nearly 20 million cases of Hepatitis E virus infections.¹ These two types of hepatitis viruses, namely hepatitis A virus (HAV) and hepatitis E virus (HEV), are transmitted via the feco-oral route through the consumption of contaminated materials, such as food, water, or direct contact with infected individuals. Hepatitis A viruses can endure for months in the environment and are resilient to food processing methods commonly used to kill pathogens.¹

Unlike hepatitis B and C, hepatitis A and E do not lead to chronic liver diseases. The infections can range from asymptomatic or subclinical to acute viral hepatitis, and in severe cases, mortality can occur. Pregnant women with HEV infections face a significantly higher mortality rate, with up to 20-25% mortality in the third trimester. In immunosuppressed individuals, such as those who have undergone solid organ transplants, stem cell transplants, or are HIV positive, chronic hepatitis E infection cases have been reported, primarily associated with genotype 3 or 4 infections.²

In cases of acute HAV disease, serum tests detect immunoglobulin (Ig)M antibodies to HAV, which remain

present for approximately three months. After that period, immunoglobulin G (IgG) antibodies to HAV can be detected indefinitely. Similarly, for HEV infection, anti-HEV IgM is detectable for the initial three months, followed by the presence of anti-HEV IgG antibodies indefinitely.³

To comprehend the nature of the disease and formulate effective management strategies, it is crucial to understand the disease burden. Presently, there is limited recent data available regarding these viruses in Delhi and its surrounding regions. This study was conducted to gather insights into the prevalence of enteric transmitted hepatitis viruses among patients with acute hepatitis in Delhi and its environs.

METHODS

Study design

This was a retrospective study.

Study site

The study was conducted at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. This 2800-bed tertiary care multispecialty hospital serves a catchment area that includes Delhi and its neighbouring states. The hospital witnesses a daily average of 12,500 outpatient department visits and 550 inpatient admissions.

Duration of study

The study was carried out between February 2019 to December 2022.

Inclusion criteria

This study encompassed all consecutive samples submitted to the department of microbiology for HAV and HEV infection testing in clinically suspected acute viral hepatitis (AVH) cases. Test outcomes were retrieved from records and subjected to analysis.

Laboratory investigations

Detection of IgM antibodies against HAV and HEV was conducted using serum samples. Commercial kits (Bioneovan Co. Ltd., Beijing, China) were employed for the enzyme-linked immunosorbent assay in accordance with the manufacturer's instructions.

Statistical analysis

Information from manual records (pen and paper format) was inputted into an Excel spreadsheet. Analysis was carried out utilizing SPSS software version 21 (SPSS Statistics for Windows, version 21.0. Armonk, NY: IBM Corp.). Statistical significance of associations among demographic factors of HAV and HEV infection was

determined using the chi-square (χ^2) test and Fisher's exact test (if cell frequency was <5).

RESULTS

During the study period, a total of 1275 samples were collected, comprising 556 (43.6%) males and 719 (56.4%) females. Among these, 426 fell within the pediatric age group (33.4%), while 849 (66.6%) were categorized as adolescents and adults (Table 1).

Table 1: Age, gender and year wise distribution of HAV and HEV infection in patients presenting with hepatitis.

	IgM HAV N (%)	IgM HEV N (%)	Total N (%)
Males (n=556)	80 (14.4)	32 (5.6)	112 (20.1)
Females (n=719)	62 (8.6)	23 (3.2)	85 (11.8)
≤12 years (n=426)	89 (20.9)	6 (1.4)	95 (22.3)
>12 years (n=849)	53 (6.4)	49 (5.8)	103 (12.1)
Males			
≤12 years (n=293)	49 (16.7)	4 (1.4)	53 (18.1)
>12 years (n=263)	31 (11.8)	28 (10.6)	59 (22.4)
Females			
≤12 years (n=133)	40 (30.1)	2 (1.5)	42 (31.6)
>12 years (n=586)	22 (3.8)	21 (3.6)	43 (7.3)
Total (n=1275)	142 (11.1)	55 (4.3)	197 (15.5)
2019 (n=385)	53 (13.8)	38 (9.9)	91 (23.6)
2020 (n=286)	22 (7.7)	9 (3.1)	31 (10.8)
2021 (n=367)	23 (6.3)	3 (0.8)	26 (7.1)
2022 (n=237)	44 (18.6)	5 (2.1)	49 (20.7)

The presence of viral aetiology was identified in 197 (15.5%) patients. Specifically, IgM HAV was detected in 142 (11.1%) patients, and IgM HEV was found in 55 (4.3%) patients. Notably, a co-infection of HAV and HEV was observed in four male patients, of which three were adults, and one belonged to the pediatric age group (Table 1).

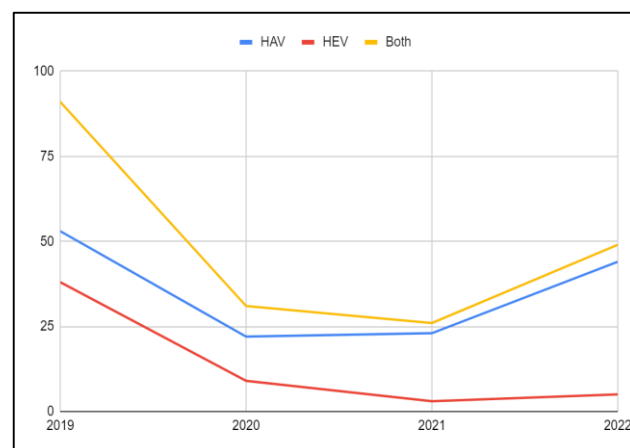


Figure 1: Year-wise trend of HAV and HEV seropositive cases in Delhi from 2019-22.

As indicated in Table 1, the percentage of positive cases for IgM antibodies against HAV and HEV was significantly higher in males (20.1%, n=112) compared to females (11.8%, n=85), with a p value of less than 0.001. Viral etiology was more prevalent in the pediatric age group (22.3%, n=95) than in the adult age group (12.1%, n=103), with a statistically significant difference ($p<0.001$). The percentage of positive viral etiology cases exhibited a significant decrease from 2019 to 2021, followed by a notable increase from 2021 to 2022 ($p<0.001$), as illustrated in Figure 1. Furthermore, HAV infection was significantly more common in the pediatric

age group (20.9%, 89/426; $p<0.001$), while HEV infection was notably higher in the adolescent and adult age group (5.8%, 49/849; $p<0.001$).

DISCUSSION

Despite advancements in sanitation practices, hygiene measures, and vaccine availability, enteric transmitted hepatitis viruses continue to trigger outbreaks on a global scale. The incidence of global hepatitis A cases surged by 13.90%, escalating from 139.54 million in 1990 to 158.94 million in 2019.⁴

Table 2: Comparison of seroprevalence of HAV and HEV infection across various studies in India.

Study	Place of study	Year of study	Total samples	HAV seroprevalence	HEV seroprevalence	HAV and HEV seroprevalence
Rajani et al ⁵	Delhi	2008	600	8.3	3.5	11.8
Jain et al ⁶	North India	2012	267	26.96	17.97	44.83
Agrawal et al ⁷	Delhi	2015	475	9.4	23.3	38.1
Rawat et al ⁸	Haryana	2019	416	31.1	44.9	75
Barde et al ⁹	Madhya Pradesh	2019	1901	5.1	13.7	18.8
Samaddar et al ¹⁰	Mumbai	2019	675	6.96	9.63	18.66
Kalita et al ¹¹	Uttarakhand	2020	617	14.7	28	37.6
Meghna et al ¹²	Maharashtra	2020	1807	6.7	8.5	15.1
Garima et al ¹³	Sub Himalayan region	2022	573	16.4	18.67	35.1
Present study	Delhi	2022	1275	11.1	4.3	15.5

In this study, the seroprevalence of enteric transmitted viruses (HAV and HEV) stood at 15.45%. However, as illustrated in Table 2, this seroprevalence varies across time, location, and individuals, spanning from 11% to 85%. In the current investigation, the seroprevalence of HAV reached 11.13%, surpassing figures from studies conducted in Delhi in 2008 and 2015. HAV seroprevalence ranged from 5% to 54% across the nation, while HEV seroprevalence ranged from 3% to 45%. Conversely, the study found a 4.31% HEV seroprevalence, surpassing the 2008 data, yet falling short of the 2015 results in Delhi (Table 2).

Clinical manifestations of HAV infection vary with age. Infants and young children under 6 years often remain asymptomatic, with only around 10% developing jaundice.¹ Adults experience symptoms more frequently. Pediatric patients demonstrated a predominant prevalence of HAV infection (20.89%) compared to adolescents and adults (6.36%). By adulthood, over 90% of individuals acquire HAV exposure and develop protective antibodies, conferring lifelong immunity and prevention of reinfection.¹⁴ This likely contributes to the relatively low HAV seroprevalence (6.36%) observed in adults with acute viral hepatitis.

Symptomatic HEV infection tends to occur more frequently in adults than in children.⁵ This pattern is echoed in the study, with HEV infection significantly

higher in adults (5.77%) than in children (1.4%). HEV infection is associated with diverse extrahepatic manifestations, such as glomerulonephritis, hematological disorders, and autoimmune conditions.² HEV's lower likelihood of person-to-person spread compared to HAV results in fewer individual sporadic cases and more outbreaks due to contaminated water, like monsoon flooding.¹ While HAV infection can also present with extrahepatic signs, they are exceedingly rare, potentially explaining the lower HEV seroprevalence (4.31%) compared to HAV (11.13%) in this study.³ However, HEV's seroprevalence remained notably lower than in other studies across the country (Table 2).

Interestingly, enteric transmitted viral infections were notably lower in 2020 (10.8%) and 2021 (7.08%), rebounding in 2022 (20.67%) (Table 1). The rapid global spread of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) led to multiple strict lockdowns in India from March 2020 till 2021. Throughout this period, people likely faced restricted options when it came to purchasing external food and beverages. Consequently, they were compelled to prepare meals at home, leading to a decrease in their exposure to contaminated food and water. Additionally, healthcare-seeking behaviour predominantly involved severe or critical cases during this timeframe, potentially contributing to underreported instances. The halt in lockdowns after 2021 seemingly prompted increased exposure to contaminated food and

water again, leading to a resurgence in enteric transmitted viral infections in 2022 (20.67%). Notably, the rise was less pronounced than in 2019 (23.6%) (Figure 1), possibly due to sustained sanitation and personal hygiene practices post-lockdown.

CONCLUSION

In conclusion, a comprehensive assessment of enteric transmitted viruses causing hepatitis should encompass both hospital and community levels to grasp the actual disease burden and evolving epidemiology. Such surveillance is pivotal for effective planning and policymaking to control and prevent these viruses.⁸

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