

# Seroprevalence and Trends of Enterally Transmitted Hepatitis Viruses in a Tertiary Care Hospital: A 3-year Study

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## ABSTRACT

**Background and objectives:** Despite the significant achievements in recent decades to control viral hepatitis worldwide, hepatitis A virus (HAV) and hepatitis E virus (HEV) infections remain a matter of significant public health concern. Both viruses are transmitted primarily by orofecal route and are present higher in communities with poor sanitation. They cause a disease that is indistinguishable without serologic testing. Prevalence of HEV is less frequent even in endemic areas (7.8–45%), compared to HAV infection (up to 100% in low-income countries). The present study was undertaken to investigate the prevalence of HAV and HEV and to study their seasonal variations.

**Materials and methods:** This was a retrospective study over a period of 3 years. Serum samples from patients suspected of viral hepatitis were tested for anti-HAV and anti-HEV immunoglobulin (Ig) M antibodies by enzyme-linked immunosorbent assay (ELISA). Seasonal trends of HAV and HEV were also studied.

**Results:** The overall percentage positivity for HAV and HEV was 15.4% and 13.9% and the prevalence was more in the males. Majority of cases of HAV infection were in the age-group of 11–20 years, whereas HEV infection was predominant in the age-group of 21–30 years. There was a year-wise increasing trend of HAV and HEV seroprevalence. On comparing the seasonal trends, hepatitis A was more during the monsoon (17.6%) and hepatitis E was more during the summer season (15.1%).

**Conclusion:** The prevalence of hepatitis A was more when compared to hepatitis E, and majority of the patients were males.

**Keywords:** Hepatitis A virus, Hepatitis E virus, Prevalence, Viral hepatitis.

*Journal of Gastrointestinal Infections* (2019): 10.5005/jp-journals-10068-3032

## INTRODUCTION

Communicable diseases are still the major health problem in our country, and the hepatitis viruses residing in India are usually the endemic forms. Viral hepatitis can be defined as inflammation of liver due to infection of any of the hepatotropic viruses.<sup>1</sup> These hepatotropic viruses are divided into enteral and parenteral groups on the basis of their mode of transmission. Both hepatitis A virus (HAV) and hepatitis E virus (HEV) are enterally transmitted by the orofecal route and do not exist in a chronic carrier state. Hepatitis B virus (HBV), hepatitis C virus (HCV), and hepatitis D virus are parenterally transmitted, occur in both acute and chronic forms, and serve as a reservoir for infection when they persist in a chronic carrier state. They have the potential to cause chronic hepatitis, cirrhosis, and hepatocellular carcinoma.<sup>2</sup>

Viral hepatitis is reporting from almost all countries in the world, and it is considered as a global public health problem associated with substantial morbidity and mortality.<sup>3</sup> This is also a serious problem in India and has been reported from all parts of this country.<sup>4</sup> The World Health Organization (WHO) executive board<sup>1</sup> certifies that 10 lakh people die each year due to the causes related to viral hepatitis, which is 2.7% of the total deaths that occur in the world. Some groups are at high risk of contracting this disease compared with others. Both HAV and HEV are found higher in communities where food and sanitation are poor, and HBV and HCV infections are seen more common among the recipients of organs, blood, and tissues and also among the healthcare providers who sustain accidental needle stick injuries.<sup>5</sup> The symptoms of acute infections are jaundice, dark urine, extreme fatigue, nausea, vomiting, and abdominal pain.<sup>6</sup>

Known for its global distribution,<sup>7</sup> HAV is a nonenveloped 27-nm, ribonucleic acid (RNA) virus of the genus *Hepatovirus* of the

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**How to cite this article:** Gupta V, Chhina D, Mittal N. Seroprevalence and Trends of Enterally Transmitted Hepatitis Viruses in a Tertiary Care Hospital: A 3-year Study. *J Gastrointest Infect* 2019;9(1):23–27.

**Source of support:** Nil

**Conflict of interest:** None

family Picornaviridae. Antibodies to HAV (anti-HAV) can be detected during acute illness when the serum aminotransferase activity is elevated and fecal HAV shedding is still occurring. Hepatitis E virus (HEV) occurs primarily in Asia, Africa, and Central America. It is a nonenveloped virus with a single-stranded positive-sense RNA of the genus *Hepevirus* of the family Hepeviridae.<sup>8</sup> Both HAV and HEV display considerable differences regarding their nature and epidemiology. Immunity to HAV is lifelong, and infection is often acquired early in life, while most of the HEV infections occur in late childhood or young adulthood.

Hepatitis A virus (HAV) infection is a common infection responsible for about 1.4 million new infections worldwide each year.<sup>9</sup> Studies conducted in India by Acharya et al.<sup>10</sup> and Nanda et al.<sup>11</sup> also observed that enteric hepatitis is highly endemic in India. Studies reveal that HAV is a predominant cause of viral hepatitis,<sup>12</sup> and it constitutes around 32.1% of the total viral hepatitis reported all over the world.<sup>13</sup> Kunasol et al.<sup>14</sup> reported that India was highly endemic for HAV. In India, HEV causes acute sporadic hepatitis in 30–70% cases and is the major cause of liver failure.<sup>11</sup> India is

hyperendemic for HAV and HEV.<sup>10</sup> Thus, the present study was undertaken to find the prevalence of HAV and HEV and to study seasonal variations for 3 years.

## MATERIALS AND METHODS

This was a 3-year retrospective study (July 2016 to June 2019). The study population included individuals from all age-groups who were suspected of acute viral hepatitis. This study was approved by the Institutional Ethics Committee. From each patient, about 5–10 mL of venous blood was collected in a vacutainer without anticoagulant. Serum was separated after centrifugation and then stored at 4°C until further processing. These sera were tested for anti-HAV IgM (Roche Diagnostics India Pvt. Ltd.), and anti-HEV IgM (Beijing WANTAI Biological Pharmacy Enterprise Co. Ltd., Beijing), by ELISA. Tests were carried out per the manufacturer's guidelines and interpreted as reactive or nonreactive. Seasonal trends of HAV and HEV for winter (November to February), summer (March to June), and monsoon (July to October) were also studied.

## RESULTS

A total of 4,878 samples were received for HAV and 4,858 samples for HEV, of which 755 were positive for HAV and 680 were positive for HEV. The overall percentage positivity for HAV and HEV was 15.4% and 13.9%. There was year-wise increasing trend of HAV seroprevalence (10.4%, 14.4%, and 20.5%) and HEV seroprevalence (13.3%, 13.8%, and 14.6%) in 2016–2017, 2017–2018, and 2018–2019, respectively (Fig. 1) The prevalence of both viral HAV and HEV was more in males (73.2% and 72.1%) compared to females (Table 1). The majority of cases of HAV infection (42.2%) were in the age-group of 11 to 20 years, whereas HEV infection was predominant (30.4%) in the age-group of 21 to 30 years (Table 2). On comparing the seasonal trends, the overall seroprevalence of HAV observed was 17.6%,

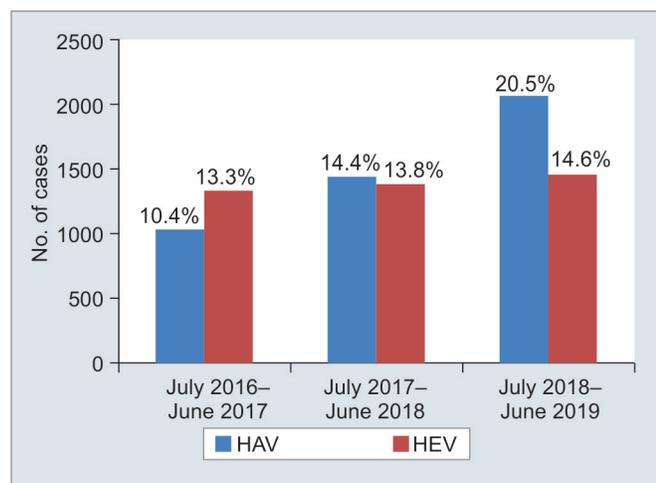


Fig. 1: Year-wise seroprevalence of hepatitis A and E

Table 1: Sex-wise distribution of hepatitis A virus (HAV) and hepatitis E virus (HEV) positive cases

	HAV		Total	HEV		Total
	Male	Female		Male	Female	
2016–17	110 (71.9)	43 (28.1)	153	135 (69.9)	58 (30.1)	193
2017–18	177 (75)	59 (25)	236	169 (73.8)	60 (26.2)	229
2018–19	265 (72.4)	101 (27.6)	366	186 (72.1)	72 (21.9)	258
Total	552 (73.1)	203 (26.9)	755	490 (72.1)	190 (27.9)	680

11.2%, and 16.5% and HEV 12.6%, 14.5%, and 15.1% in monsoon, winter, and summer seasons, respectively (Table 3, Figs 2 and 3).

## DISCUSSION

Viral hepatitis is a major public health problem throughout the world. Moreover, all types of viruses, already characterized and identified as the causative agent of viral hepatitis infect Indian population.<sup>14</sup> In our study, among the two enterally transmitted viruses, the overall prevalence of HAV (15.4%) was more than HEV (13.9%). Singh et al.<sup>13</sup> and Joon et al.<sup>15</sup> reported the HAV seropositivity was more (32.1% and 19.31%) than that of HEV (7.19% and 10.54%). In contrast to our study, Kumar et al.,<sup>16</sup> Nandi et al.,<sup>17</sup> Antony and Celine<sup>18</sup> Manmohan et al.,<sup>19</sup> and Mittal et al.<sup>20</sup> reported higher prevalence of HEV (37.4%, 45.4%, 61.24%, 37.49%, and 14.9% respectively) as compared to HAV (14.6%, 33%, 31.54%, 32%, and 7.67%, respectively). It is supported by other studies conducted by various authors.<sup>21–24</sup>

The overall incidence of both HAV and HEV was more in males (73.1% and 72.1%), and this finding is similar to that reported by Mittal et al. (63.7% and 69.7%)<sup>20</sup> and Joon et al. (68% and 79%)<sup>15</sup> In literature, similar results were observed in other studies also.<sup>13,18,24–27</sup> It is because of greater exposure of males in their professional and social activities. In a study by Antony, Celine<sup>18</sup> and Barrientos Gutierrez et al.,<sup>28</sup> higher HAV infection was seen in males (80.62% and 77.2%) than females. But Faleh et al.<sup>29</sup> in their study on the changing patterns of HAV prevalence observed no difference among males and females. Various studies in literature also reported higher prevalence of HEV infection in males compared to that in females.<sup>19,30,31</sup>

In our study, among the enterally transmitted viruses, most of the patients infected with hepatitis A were in the age-group of 11–20 years, which is similar to the findings of many studies.<sup>17,24,31</sup> In contrast, higher HAV infection in adults (60.85% in 20–39 years),<sup>18</sup> (65% in 15–33 years)<sup>32</sup> was reported in literature. In the present study, the highest proportion of cases of HEV infection was in 21–30 years, which is similar to that reported by Antony and Celine<sup>18</sup> (52.29% in 20–39 years) and Begum et al.<sup>33</sup> (71.9% in 20–24 years). In present study, majority of hepatitis A cases were in the age-group 11–20 (42.2%) and hepatitis E in the age-group 21–30 years (30.4%) similar to that reported by Mittal et al.<sup>20</sup> (45.6% and 37.6%), respectively. The present study has shown that HEV infection occur more often in older children and adults (21–30 years), whereas HAV occurs mostly in young children (11–20 years). This finding is consistent with other studies conducted in India and shows that exposure to HAV occurs early in life. Hepatitis E virus infection is less common in young children as anicteric hepatitis or subclinical infections are common in children.<sup>34</sup>

In our study, the overall incidence of HAV infection was more during the monsoon season (17.6%), which are similar to the findings in literature.<sup>13,24</sup> In contrast to the present study, Al-Naaimi et al.<sup>26</sup> reported hepatitis A infection more in winter.

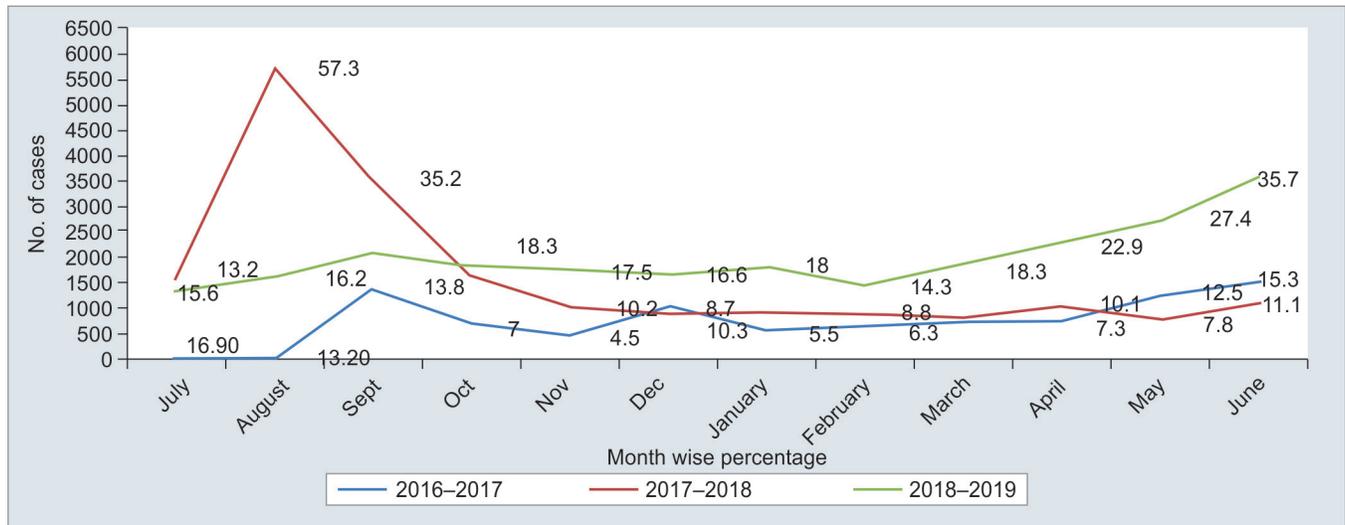
Enterally Transmitted Hepatitis Viruses

**Table 2:** Age-wise distribution of hepatitis A virus (HAV)- and hepatitis E virus (HEV)-positive cases

Age (years)	HAV			Total	HEV			Total
	2016–17	2017–18	2018–19		2016–17	2017–18	2018–19	
0–10	19 (12.4)	26 (0.1)	70 (19.1)	115 (15.2)	4 (2)	3 (1.3)	6 (2.3)	13 (1.9)
11–20	61 (39.9)	107 (45.3)	151 (41.2)	319 (42.2)	6 (3.1)	25 (10.9)	31 (12)	62 (9.1)
21–30	60 (39.2)	87 (36.9)	126 (34.4)	273 (36.1)	65 (33.7)	55 (24)	87 (33.7)	207 (30.4)
31–40	10 (6.53)	10 (4.2)	16 (4.4)	36 (4.7)	41 (21.2)	41 (17.9)	62 (22)	124 (18.2)
41–50	2 (1.3)	5 (2.1)	2 (0.5)	9 (1.2)	26 (13.5)	38 (16.6)	42 (16.3)	106 (15.5)
51–60	1 (0.6)	1 (0.4)	1 (0.3)	3 (0.4)	26 (13.5)	38 (16.6)	8 (3.1)	72 (10.5)
61–70	–	–	–	–	14 (7.2)	24 (10.5)	17 (6.6)	55 (8)
71–80	–	–	–	–	–	5 (2.2)	4 (1.5)	9 (1.3)
81–90	–	–	–	–	1 (0.5)	–	1 (0.3)	2 (0.3)
Total	153	236	366	755	183	229	258	680

**Table 3:** Seasonal trends of hepatitis A virus and hepatitis E virus

	HAV			Total	HEV			Total
	Jul–Oct (Monsoon)	Nov–Feb (Winter)	Mar–Jun (Summer)		Jul–Oct (Monsoon)	Nov–Feb (Winter)	Mar–Jun (Summer)	
July 16–June 17	75/580 (12.9%)	29/422 (6.8%)	49/458 (10.6%)	153/1460 (10.4%)	60/569 (10.6%)	54/423 (12.7%)	79/445 (17.7%)	193/1444 (13.3%)
July 17–June 18	144/644 (22.3%)	44/473 (9.3%)	48/518 (9.2%)	236/1635 (14.4%)	102/695 (14.6%)	69/459 (15%)	58/498 (11.6%)	229/1652 (13.8%)
July 18– June 19	114/659 (17.29%)	85/507 (16.7%)	167/617 (27.1%)	366/1783 (20.5%)	80/648 (12.3%)	80/510 (15.6%)	98/604 (16.2%)	258/1762 (14.6%)
Total	333/1883 (17.6%)	158/1402 (11.2%)	264/1593 (16.5%)	755/4878 (15.4%)	242/1912 (12.6%)	203/1392 (14.5%)	235/1547 (15.1%)	680/4858 (13.9%)



**Fig. 2:** Trends of hepatitis A in 3 years

Hepatitis E virus infection was more in summer (15.19%) similar to that reported by various authors.<sup>26,35</sup> However, Suri et al.<sup>24</sup> reported maximum positivity of HEV infection in winter. Mittal et al.<sup>20</sup> observed that HAV and HEV infection occurred throughout the year, with maximum number of patients in summer and in the beginning of rainy season. Joon et al.<sup>15</sup> reported predominance of HAV and HEV infection toward the end of monsoon and beginning of winter and a peak rise in HEV during the beginning of rainy season.

**CONCLUSION**

In our study, the prevalence of hepatitis A was more than hepatitis E in enterally transmitted viruses, making them a major public health problem in our area. The disease can lead to significant economic and social consequences in communities. As contaminated food and water is the main mode of transmission, much emphasis should be given for the environmental and personal hygiene practices to prevent the orofecal transmission of these pathogens. This study highlights the need for early screening of clinically diagnosed



Fig. 3: Trends of hepatitis E in 3 years

cases of viral hepatitis, so that appropriate precautions can be implemented to decrease the prevalence of these emerging infections.

**ACKNOWLEDGMENT**

The authors would like to acknowledge the technical assistance provided by Mr Sukhvinder Singh.

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