

## Original Research Article

# Prevalence of hepatitis A virus and hepatitis E virus in the patients presenting with acute viral hepatitis in Rohtak, Haryana, India

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## ABSTRACT

**Background:** Hepatitis A virus (HAV) and hepatitis E virus (HEV) cause acute hepatitis in humans and are transmitted mainly through the fecal-oral route. They pose major health problems in developing countries. This study was done to determine prevalence of HAV and HEV in patients presenting with AVH and the co-infection of HAV and HEV in these patients.

**Methods:** The study was conducted in the virology research and diagnostic laboratory, PGIMS Rohtak during the study period of August 2017-December 2018. The study population included sera of individuals from all age group who were suspected of acute viral hepatitis (AVH). All the sera were screened for IgM antibody to HEV and HAV using IgM capture ELISA.

**Results:** HEV IgM ELISA test was performed in 307 patients (mean age 34 years;), with an overall seroprevalence rate of 138(44.9%). HAV antibodies were detected in 109 subjects, with a median age of 9.5 years the seroprevalence of HAV was 34 (31.1%). HEV seropositivity was highest in the age group 20-30 years. Mean age was 34 years whereas the interquartile range was from 14-71 years. HAV infection was positive mainly in the age group <10 years. With interquartile range from 6-16 years. Out of total 34 patients positive for HAV infection males were 20 (58.8%), whereas females were 14(41.1%). HEV IgM was positive in 138 patients, out of which male were 96 (69.56%) and females were 42 (30.43%). HEV IgM was positive in 138 patients, out of which male were 96 (69.56%) and females were 42 (30.43%). HAV and HEV seen to be prevalent all with highest predominance seen towards the end of monsoons (August and September) and beginning of winters.

**Conclusions:** The present study also points toward HEV being the prime etiological agent for outbreaks of acute hepatitis in the studied region of Haryana (Rohtak), India. A comparatively lower HAV prevalence may be the consequence of an overall declining trend due to improved living standards and environmental hygiene.

**Keywords:** ELISA test, HAV, HEV, Seroprevalence

## INTRODUCTION

Acute viral hepatitis (AVH) caused by enterically transmitted hepatitis A virus (HAV) and hepatitis E virus (HEV) poses a major health problem in developing countries such as India. Both viruses are transmitted

primarily by the fecal-oral route and causes acute viral hepatitis.<sup>1</sup> HAV is the most common cause of acute hepatitis in pediatric age group (1-3 years).<sup>2</sup> HAV remains self-limiting and does not progress to chronic liver disease. Children with HAV tend to present with nonspecific gastrointestinal symptoms, and jaundice with cholestasis is common. Viral HAV in adults has more

severe course than in children.<sup>3,4</sup> HAV is a non-enveloped 27-nm, heat-, acid-, and ether-resistant ribonucleic acid (RNA) virus in the genus Hepato-virus of the family picornaviridae. Antibodies to HAV (anti-HAV) can be detected during acute illness when serum aminotransferase activity is elevated and faecal HAV shedding is still occurring. This early antibody response is predominantly of the IgM class and persists for several months, rarely for 6-12 months. During convalescence, however, anti-HAV of the IgG class becomes the predominant antibody. Hepatitis A remains self-limited and does not progress to chronic liver disease.<sup>5</sup> Hepatitis E virus (HEV) is also an enterically transmitted virus that occurs primarily in Asia, Africa, and Central America. HEV is a non-enveloped virus with a single-stranded positive-sense RNA in the genus Herpesvirus of the family Herpesviridae. The IgM and IgG classes of antibodies to HEV (anti-HEV IgM and anti-HEV IgG) can be detected, but the former falls rapidly after acute infection, reaching low levels within 6 months. Currently, serologic testing for HEV infection is not available routinely.<sup>5</sup> HEV affects young to middle-aged adults and causes high mortality in pregnant women, 20-30% as compared to 0.2-1% in general population.<sup>6</sup> HEV infection during pregnancy is associated with increased risk of prematurity, abortion, low birth weight, perinatal mortality, fulminant hepatitis, and maternal mortality.<sup>7</sup> The present study was undertaken to investigate the contribution of HEV and HAV among cases of waterborne hepatitis and to study their epidemiology in relation to age and seasonal prevalence of these infections in this region.

**METHODS**

The cross-sectional study was conducted in the virology research and diagnostic laboratory, PGIMS Rohtak, Haryana, India during the study period of August 2017-December 2018. The study population included serum of individuals from all age group of both sexes who were suspected of acute viral hepatitis (AVH) with deranged liver function test. Each sample was accompanied by full requisite form having information regarding name, age, sex, residential address, symptoms of AVH such as jaundice, fever, malaise, nausea, vomiting, diarrhea, and abdominal pain, date of onset of symptoms, and date of sample collection. All the samples were screened for IgM antibody to HEV and HAV using IgM capture ELISA (Dia. pro diagnostic bio probes, Italy) in accordance with the manufacturer's instructions. It is based on indirect sandwich ELISA method. The study was approved by the research and ethical committee of PGIMS Rohtak.

**Statistical analysis**

Data collected was fed in to Microsoft Excel and analysis were done using SPSS version 11.

**RESULTS**

HEV IgM ELISA test was performed in 307 patients (mean age 34 years;) with an overall seroprevalence rate of 138(44.9%). The seropositivity rate was higher in males 69.56% than in females (30.43%) (Table1).

**Table 1: Seroprevalence of HEV infection.**

	HEV negative	HEV positive
Total patients (307)	75	138 (44.9%)
Males (198)	47	96 (69.56%)
Females (109)	28	42 (30.43%)

HAV antibodies were detected in 109 subjects, with a median age of 9.5 years the seroprevalence of HAV was 34(31.1%), with the higher seroprevalence in males (58.8%) than in females (41.1%) (Table 2).

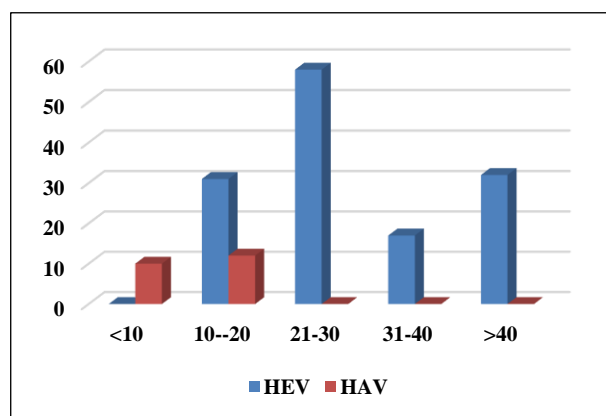
**Table 2: Seroprevalence of HAV infection.**

	HAV negative	HAV positive
Total patients (109)	75	34 (31.1%)
Males (67)	47	20 (58.8%)
Females (42)	28	14 (41.1%)

Age-wise distribution of positive cases of hepatitis A virus and hepatitis E virus

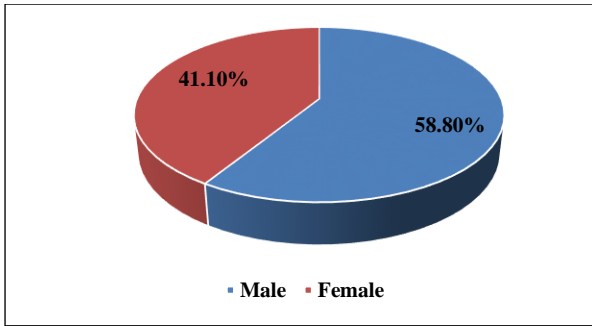
HEV seropositivity was highest in the age group 20-30 years. Mean age was 34 years whereas the interquartile range was from 14-71 years.

HAV infection was positive mainly in the age group <10 years. With interquartile range from 6-16years (Figure 1).



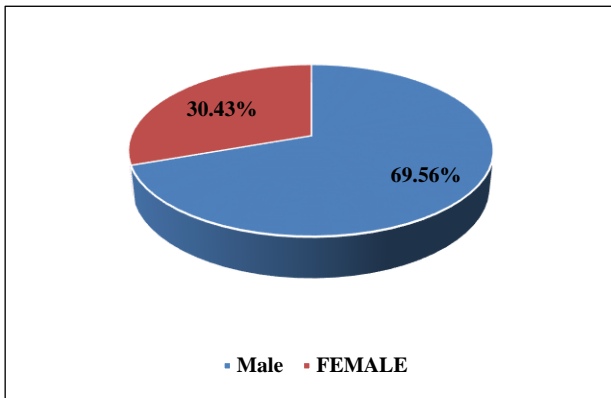
**Figure 1: Age wise distribution of patients for HEV and HAV.**

Sex distribution of HAV infection and HEV infection. Out of total 34 patients positive for HAV infection (Figure 2) males were 20 (58.8%), whereas females were 14(41.1%).

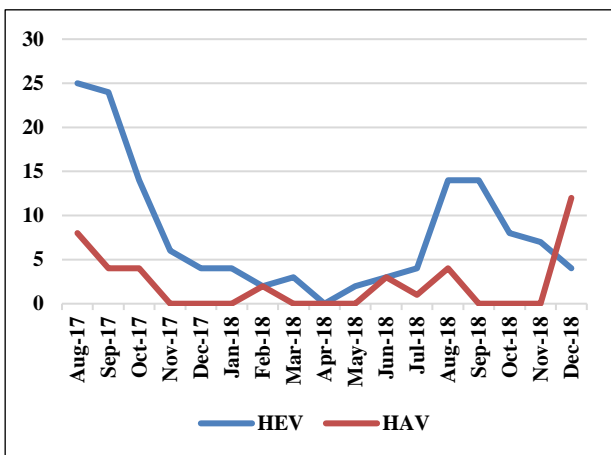


**Figure 2: Sex distribution among HAV positive females.**

HEV IgM (Figure 3) was positive in 138 patients, out of which male were 96(69.56%) and females were 42 (30.43%). Seasonal distribution of HAV and HEV infection.



**Figure 3: Sex distribution among HEV positive patients.**



**Figure 4: Month wise distribution of HAV and HEV infection.**

As per the figure HAV and HEV infection were seen to be prevalent towards the end of monsoons (August and September) and beginning of winters. Highest seroprevalence of HEV infection was recorded in August and September months whereas HAV infection was

found to be prevalent in August as well as in December 2018 month.

**DISCUSSION**

HEV has been reported as a major causative agent in outbreaks reported from different parts of India. The present study also points toward HEV being the prime etiological agent for outbreaks of acute hepatitis in the studied region of Haryana, (Rohtak), India. Similar outbreaks have been reported from Kanpur, Rajasthan, Kolkata, Hyderabad and Ahmedabad.<sup>7-11</sup>

A relatively high prevalence (44.9%) of HEV has been recorded in the current study. Similar figures were reported from other studies also.<sup>12-14</sup> However, the prevalence observed for HAV was low as compared to HEV (31.1%) indicating that HAV was also circulating. Several studies from India have reported a varying prevalence of HAV ranging from 1.7% to 67%.<sup>15</sup> Lower HAV prevalence may be the consequence of declining trend due to improved living standards and environmental hygiene.

Prevalence of both HEV (69%) and HAV (58%) were higher in males than in females which is in accordance with other studies.<sup>16-18</sup> It could be related to greater exposure of men in their professional and social activities

Adults in the age group of 21-30 years were predominantly infected with HEV in comparison to children (<20 years) in HAV. This trend has been a hall mark of HEV and HAV epidemiology as well as in other studies also.<sup>18</sup>

In present study one pregnant female was found to be HEV positive. She presented with fulminant hepatitis. HEV infection in pregnancy usually results in fulminant hepatitis.

Out of the total patients tested who were negative for HEV and HAV infection, two patients were found to be HBsAg positive. Thus, seronegative patients should always be screened for HBV and HCV infection.

HEV infections were diagnosed in mainly in monsoon time (August, September), followed by winters whereas HAV infections were more commonly encountered during winters followed by monsoon season. The heavy run off during rains causes contamination of water leading to excess of HAV and HEV infections during the rainy season. Similar outbreaks during rainy season have been reported in other studies also.<sup>19,20</sup> Outbreak in winters may be related to fecal contamination of water pipelines leading to contamination of drinking water.

**CONCLUSION**

Clinical diagnosis of acute viral hepatitis must be confirmed by serology to detect all the types of causative

viruses (A, B, C and E). HEV screening in symptomatic pregnant female is important as outcome of infection with HEV is very poor. Improving personal and food hygiene among lower socio-economic population, periodic surveillance of HAV/HEV. exposure pattern may be of immense public health value. Mapping of areas should be done if segregation of samples from same area occurs and accordingly measures should be taken. Safe water supply and safe sewage disposal is of great importance in curtailing such outbreaks.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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