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Seroprevalence of Hepatitis A and E Virus Infections in Patients with Suspected Acute Viral Hepatitis at a Tertiary Care Centre in South India

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ABSTRACT

Background: Hepatitis A virus (HAV) and hepatitis E virus (HEV) are important causes of acute viral hepatitis in India. Data on their seroprevalence, demographic distribution, and co-infection with hepatitis B virus (HBV) and hepatitis C virus (HCV), remain limited from South India. This study aimed to determine the seroprevalence and epidemiological profile of HAV and HEV infections among patients with suspected acute viral hepatitis. **Methods:** A retrospective record-based study was conducted at a tertiary care centre in South India over a four-year period. Laboratory records of 612 patients evaluated for suspected acute viral hepatitis were retrieved. Serological results for anti-HAV IgM, anti-HAV IgG, anti-HEV IgM, HBsAg and anti-HCV were analysed along with demographic characteristics, pregnancy status and seasonal distribution. **Results:** Acute HAV and HEV infection was detected in 198 (32.4%) patients. HAV infection was more common than HEV infection [135 (22.1%) vs. 54 (8.8%)], while mixed HAV–HEV infection was observed in 9 (1.5%) patients. HAV infection occurred mainly among children and adolescents, whereas HEV infection was more frequent among young and middle-aged adults. Isolated anti-HAV IgG positivity was detected in 72 patients. Concurrent HBV and/or HCV infection was identified in 48 (7.8%) patients. Among 36 pregnant women, HEV infection was more frequent than HAV infection [9 (25.0%) vs. 6 (16.7%)], with most HEV-positive cases detected during the third trimester. Nearly three-fourths of acute HAV and HEV infections occurred during the monsoon and post-monsoon months. **Conclusion:** Acute HAV infection was more common than HEV infection among patients with suspected acute viral hepatitis. HAV infection occurred mainly among children and adolescents, whereas HEV infection was more frequent among adults and pregnant women. Concurrent HBV and/or HCV infection and seasonal clustering were also observed. Comprehensive serological assessment provides valuable epidemiological information for the evaluation of acute viral hepatitis.

KEYWORDS: Coinfection; Pregnancy; Seasonal variation; Serological markers; Anti-HAV IgG

INTRODUCTION

Acute viral hepatitis is a common cause of hospital referral in India, and the enterically transmitted forms caused by HAV and HEV continue to account for a significant proportion of cases even as urban sanitation has gradually improved[1, 2]. Serological surveys from Indian populations have documented a shift from high towards intermediate HAV endemicity in urban groups of higher socioeconomic status, with a corresponding rise in the pool of adolescents and adults who reach adulthood without natural immunity[3, 4].

HAV infection typically occurs in childhood and runs a self-limited course, whereas HEV tends to affect working-age adults and, in certain groups particularly in pregnant women carries a risk of fulminant hepatic failure [3-6]. Because clinical presentation alone cannot distinguish

HAV from HEV, serological testing is the only reliable basis for diagnosis and surveillance[7].

Seroprevalence data from Indian centres have varied widely, reflecting differences in geography, population demographics, referral pattern and testing strategy[8-11]. Most published series from this region have tested only for IgM, which identifies active infection but says nothing about the proportion of the population with pre-existing immunity — information that IgG profiling would provide[3, 4]. Less attention has been paid to patients who develop acute HAV or HEV against a background of hepatitis B or hepatitis C infection, a group at substantially higher risk of hepatic decompensation and one that requires different clinical management[12, 13]. In a North Indian series of 267 patients with acute viral hepatitis, HBV and HCV accounted for 16.10% and 11.98% of cases respectively[8]. Similarly, HEV in pregnancy and the seasonal distribution of cases have received limited systematic attention in South Indian studies.

We therefore undertook a retrospective observational analysis of 612 patients at our tertiary centre to address these gaps collectively. We examined combined IgM and IgG serological patterns, documented concurrent HBsAg and anti-HCV positivity, evaluated HAV and HEV seropositivity in pregnant women across trimesters, and investigated the clustering of cases in relation to South India's monsoon calendar.

MATERIALS AND METHODS

Study design and setting: This retrospective study was conducted in the Department of Microbiology of a tertiary care teaching hospital in South India between January 2021 and December 2024.

Study Population: Laboratory records of patients who underwent serological testing for suspected acute viral hepatitis from January 2021 to December 2024 were retrieved. Patients of all age groups and both sexes were eligible for inclusion. Clinical suspicion of acute viral hepatitis was based on the treating clinician's assessment supported by compatible clinical features, including jaundice, fever, malaise, anorexia, nausea or vomiting, abdominal discomfort, and biochemical evidence of hepatocellular injury. Records with incomplete demographic information and samples reported as haemolysed or inadequate for serological testing were excluded from the analysis.

Ethical Approval: As the study involved retrospective analysis of anonymised laboratory and hospital records without any direct patient contact or intervention, the requirement for obtaining informed consent was waived by the Institutional Ethics Committee. Confidentiality of patient information was maintained throughout the study.

Data collection: Relevant demographic and laboratory information was retrieved from laboratory request forms, the laboratory information system, and available hospital records. Data collected included age, sex, pregnancy status, gestational age, and the date of sample collection. Pregnant women were categorised into first (1–12 weeks), second (13–27 weeks), and third (≥28 weeks) trimesters according to the recorded gestational age. The recorded month of sample collection was used for seasonal analysis.

Laboratory investigations: Laboratory data were retrieved retrospectively from the records of the Department of Microbiology. As part of the routine diagnostic work-up, serum samples from patients with suspected acute viral hepatitis had been tested for anti-HAV IgM, anti-HAV IgG, anti-HEV IgM, anti-HEV IgG, hepatitis B surface antigen (HBsAg), and anti-HCV antibodies using commercially available enzyme-linked immunosorbent assay (ELISA) kits in accordance with the manufacturers' instructions and the standard operating procedures of the laboratory. The recorded serological findings were extracted for analysis. IgM positivity was considered indicative of recent or acute infection, whereas isolated IgG positivity was interpreted as evidence of previous exposure or acquired immunity.

Statistical analysis: The extracted data were entered into Microsoft Excel and analysed using descriptive statistical methods. Categorical variables were summarised as frequencies and percentages. The findings are presented using tables and graphical illustrations wherever appropriate.

RESULTS

Laboratory records of 612 patients with suspected acute viral hepatitis were included in the study. Of these, 412 (67.3%) were males and 200 (32.7%) were females. Among female patients, 36 (18.0%) were pregnant.

Serological profile and co-infection

Acute HAV infection (anti-HAV IgM only) was detected in 135 (22.1%) patients, acute HEV infection (anti-HEV IgM only) in 54 (8.8%), and mixed HAV–HEV infection in 9 (1.5%), giving an overall prevalence of 198 (32.4%) acute HAV and/or HEV infections. HBsAg and anti-HCV positivity were detected in 55 (9.0%) and 31 (5.1%) patients, respectively [Table. 1].

Among the study population, 48 (7.8%) patients had concurrent HBV and/or HCV infection with acute HAV and/or HEV infection. Co-infection with HBsAg was observed in 12 HAV-positive and 18 HEV-positive patients, while anti-HCV positivity was detected in 9 HAV-positive and 6 HEV-positive patients. Triple positivity for HAV/HEV, HBsAg, and anti-HCV was observed in three patients [Table. 2].

Age and sex distribution of acute HAV and HEV infections

Among the 135 patients with acute HAV infection, 99 (73.3%) were males and 36 (26.7%) were females. Similarly, among the 54 patients with acute HEV infection, 36 (66.7%) were males and 18 (33.3%) were females. All nine mixed HAV–HEV infections occurred in male patients [Table. 3].

Serological marker	No. (%)
Anti-HAV IgM only	135 (22.1)
Anti-HEV IgM only	54 (8.8)
Mixed HAV–HEV infection	9 (1.5)
HBsAg positivity*	55 (9.0)
Anti-HCV positivity*	31 (5.1)

Table 1: Serological profile among patients with suspected acute viral hepatitis (N = 612)

Overall prevalence of acute HAV and/or HEV infections= 135+54+09=198 (32.4%)

**HBsAg and anti-HCV positivity include patients with concurrent acute HAV and/or HEV infection. Details of the co-infection patterns are presented in [Table. 2].*

Co-infection pattern	No.
HAV + HBsAg	12
HEV + HBsAg	18
HAV + Anti-HCV	9
HEV + Anti-HCV	6
HAV/HEV + HBsAg + Anti-HCV	3
Total unique co-infected patients	48

Table 2: HBV and HCV co-infection among patients with acute HAV and/or HEV infection (n = 48)

Serological marker	Male n (%)	Female n (%)	Total
Anti-HAV IgM only	99 (73.3)	36 (26.7)	135
Anti-HEV IgM only	36 (66.7)	18 (33.3)	54
Mixed HAV–HEV IgM	9 (100.0)	0	9

Table 3: Sex wise distribution of acute HAV and HEV infections

Acute HAV infection was most frequently observed in the 11–20-year age group (54/135; 40.0%), followed by the 0–10-year and 21–30-year age groups (36 cases each). Acute HEV infection predominantly affected adults aged 21–60 years, with the highest number of cases occurring in the 21–30-year and 51–60-year age groups (18 cases each). Mixed HAV–HEV infection was observed exclusively among patients aged 21–30 years. Isolated HAV IgG reactivity was detected predominantly among younger age groups [Table. 4].

Age group (years)	Anti-HAV IgM (n=135)	Anti-HEV IgM (n=54)	Mixed HAV–HEV	HAV IgG only
0–10	36	–	–	12
11–20	54	9	–	21
21–30	36	18	9	18
31–40	9	–	–	9
41–50	–	9	–	6
51–60	–	18	–	6

Table 4: Age-wise distribution of acute HAV and HEV infections and isolated HAV IgG reactivity

Serological profile among pregnant women

Among the 200 female patients, 36 (18.0%) were pregnant at the time of testing. Anti-HEV IgM positivity was detected in 9 (25.0%) pregnant women, including six cases in the third trimester. Anti-HAV IgM positivity was observed in 6 (16.7%) women, of whom three were in the third trimester. Mixed HAV–HEV infection was identified in one woman during the second trimester. HBsAg and anti-HCV positivity were detected in 3 (8.3%) and 2 (5.6%) pregnant women, respectively. One HBsAg-positive pregnant woman had concurrent acute HAV infection during the second trimester. The trimester-wise distribution of serological markers is presented in [Table. 5].

Trimester	HEV IgM+	HAV IgM+	Mixed	HBsAg+	Anti-HCV+
First (1–12 weeks)	1	1	0	1	0
Second (13–27 weeks)	2	2	1	1	1
Third (≥28 weeks)	6	3	0	1	1
Total (n = 36)	9 (25.0%)	6 (16.7%)	1 (2.8%)	3 (8.3%)	2 (5.6%)

Table 5: Trimester-wise distribution of HAV, HEV, HBV and HCV seropositivity among pregnant women (n = 36)

Percentages are calculated using the total number of pregnant women (n = 36). Serological markers are not mutually exclusive.

Season	HAV only	HEV only	Mixed	Total
Pre-monsoon	21	6	1	28
Monsoon	63	27	5	95
Post-monsoon	33	15	2	50
Winter	18	6	1	25
Total	**135**	**54**	**9**	**198**

Table 6: Seasonal distribution of acute HAV and HEV infections (N = 198)

Seasonal distribution

Acute HAV and HEV infections occurred throughout the year, with the highest number of cases during the

monsoon season (95 cases), followed by the post-monsoon season (50 cases). Together, these seasons accounted for 145 (73.2%) of the 198 acute HAV and/or HEV infections [Table. 6].

DISCUSSION

In this four-year retrospective analysis of 612 patients evaluated for suspected acute viral hepatitis at a tertiary care centre in South India, acute HAV and/or HEV infection together accounted for nearly one-third of cases (32.4%), indicating that enterically transmitted hepatitis continues to contribute substantially to the burden of acute viral hepatitis in this setting. This proportion is broadly comparable to other Indian hospital-based series, which have reported combined HAV/HEV positivity ranging from about 15% to over 40% depending on geography, case-mix and referral pattern[8-11].

Acute HAV infection was more common than HEV infection in the present study, accounting for 22.1% and 8.8% of cases, respectively. Joon et al. [9] reported HAV and HEV seropositivity rates of 19.3% and 10.5%, respectively, while Jain et al. observed corresponding rates of 26.6% and 14.2%.[8] Similar findings have also been reported by Samaddar et al. and Palewar *et al*.[10, 11]. Our findings indicate that HAV continues to be the predominant enterically transmitted cause of acute viral hepatitis in South India.

Arankalle *et al*. demonstrated a gradual shift in HAV infection from childhood to adolescence and adulthood with declining childhood seroprevalence in India, while Acharya *et al*. also reported lower HAV seropositivity among urban school children than previously observed[3, 4]. Lemon *et al*. and Jacobsen and Wiersma also reported similar epidemiological trends at the global level[14, 15]. The present study showed a similar age distribution, with HAV infection occurring mainly among children and adolescents and HEV infection among young and middle-aged adults. Males were more frequently affected by both HAV and HEV infections, consistent with previous reports[9-11].

Arankalle *et al*. and Acharya *et al*. demonstrated declining childhood HAV seroprevalence with a gradual shift of infection to older age groups in India[3, 4]. In the present study, isolated anti-HAV IgG positivity was detected in 72 patients, suggesting previous exposure and acquired immunity. Such seroepidemiological information complements IgM testing and may help identify susceptible populations for targeted hepatitis A vaccination[15, 16].

Jain *et al*. reported HBsAg and anti-HCV positivity rates of 16.1% and 11.98%, respectively, among patients with acute viral hepatitis.[8] In the present study, the corresponding rates were 9.0% and 5.1%, with concurrent HBV and/or HCV infection identified in 48 (7.8%) patients. Ramachandran et al. and Kumar et al. reported that HEV superinfection in patients with chronic liver disease may precipitate hepatic decompensation and acute-on-chronic liver failure[12, 13]. These findings support routine screening for HBV and HCV in patients presenting with acute viral hepatitis.

Patra *et al*. and Beniwal *et al*. reported that HEV infection during pregnancy, particularly in the third trimester, is associated with severe maternal disease and poor fetal outcomes[6, 17]. A systematic review by Bigna *et al*. also confirmed the increased risk of adverse maternal and fetal outcomes associated with HEV infection in endemic regions[18]. In the present study, HEV infection was more common than HAV infection among pregnant women, and most HEV-positive cases were detected during the third trimester. Although pregnancy outcomes were not available, our findings are consistent with previous reports and support inclusion of anti-HEV IgM testing in pregnant women presenting with acute viral hepatitis.

A higher incidence of HAV and HEV infection during the monsoon and post-monsoon months have also been reported by Palewar *et al*. and Barde *et al*[11, 19]. The present study showed a similar seasonal pattern, with nearly three-fourths of acute HAV and HEV infections occurring during this period. This is likely related to contamination of drinking water during the rainy season.

The retrospective single-centre design, lack of molecular confirmation and absence of clinical outcome data may limit the generalisability of the findings. However, the findings highlight the importance of comprehensive serological assessment in understanding the epidemiology of acute viral hepatitis.

CONCLUSION

The seroprevalence of acute HAV and HEV infection was 32.4% among patients evaluated for suspected acute viral hepatitis, with HAV infection being more common than HEV infection (22.1% vs. 8.8%). HAV predominantly affected children and adolescents, whereas HEV occurred mainly among young and middle-aged adults and pregnant women. Concurrent HBV and/or HCV infection was identified in 48 (7.8%) patients, and most acute HAV and HEV infections occurred during the monsoon and post-monsoon months. These findings highlight the value of comprehensive serological assessment in characterising the epidemiology of acute viral hepatitis and identifying high-risk patient groups.

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