A-JMRHS

CLINICO BIOCHEMICAL FEATURES OF ACUTE VIRAL HEPATITIS A PATIENTS IN RELATION TO DEMOGRAPHIC FACTORS IN HILLY AREAS OF GARHWAL REGION OF UTTARAKHAND

Ankita Giri[1*], Chandra Madhur Sharma[2], Meenakshi Rawat[3]

[1*]Associate Professor, Department of Pediatrics, Veer Chandra Singh Garhwali Government Institute of Medical and Research Sciences Srinagar Garhwal.

[2]Professor and Head, Department of Pediatrics, Veer Chandra Singh Garhwali Government Institute of Medical and Research Sciences Srinagar Garhwal.

[3]Senior Resident, Department of Pediatrics, Veer Chandra Singh Garhwali Government Institute of Medical and Research Sciences Srinagar Garhwal.

Corresponding Author: Ankita Giri

Associate Professor, Department of Pediatrics, Veer Chandra Singh Garhwali Government Institute of Medical and Research Sciences Srinagar Garhwal.

Email: ankitagiri2@gmail.com

ABSTRACT

Objective: To observe prevalence of hepatitis A between spring water and tap water consumers among rural and urban population.

Methodology: This descriptive cross-sectional study was conducted over six months in selected healthcare facilities and communities across the Garhwal region. A total of 104 patients diagnosed with Acute Viral Hepatitis A were included after laboratory confirmation by IgM anti-HAV antibody testing. Data on demographic characteristics, clinical symptoms, and biochemical parameters were collected using structured questionnaires and laboratory records.

Results: Among the 104 patients, 58 (55.8%) were from rural areas and 46 (44.2%) from urban areas. The mean age was 29.6 ± 10.8 years, and males (60.6%) were more affected than females (39.4%). The majority of patients were young adults aged 18–35 years, and most rural cases were farmers or laborers. Common clinical features included jaundice (94.2%), malaise (88.5%), nausea/vomiting (75.0%), and abdominal discomfort (61.5%). Biochemically, mean SGOT and SGPT levels were 1478.5 ± 955.6 U/L and 2010.3 ± 840.2 U/L, respectively, while mean total bilirubin was 3.8 ± 1.4 mg/dL. Hepatic encephalopathy occurred in 7 (6.7%) patients, and no mortality was observed. Water testing revealed bacterial contamination in 68.9% of rural samples compared to 26.1% in urban areas ($p < 0.01$), indicating unsafe drinking water as a major contributing factor.

Conclusion: The incidence of Acute Viral Hepatitis A was higher among rural residents of the Garhwal region, predominantly affecting young males exposed to contaminated spring water. The majority of cases were mild and self-limiting, but poor sanitation and unsafe water sources remain major risk factors.

Keywords: Acute Viral Hepatitis A, Spring Water Contamination, Garhwal Region, Liver Function Tests, Waterborne Diseases, Hepatitis A Transmission, E. coli, Biochemical Markers, Public Health, Vaccination.

INTRODUCTION

Hepatitis A virus (HAV) causing acute hepatitis A continues to represent a major public health challenge, particularly in rural and hilly regions such as the Garhwal area of Uttarakhand. Known for its rugged terrain and limited access to healthcare, the Garhwal region is uniquely vulnerable to outbreaks of infectious diseases. HAV primarily transmitted through contaminated water and food has been a persistent concern in the region(1).

www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 29-05-2026
Date Acceptance: 07-06-2026
Date of Publication: 06-07-2026

With the lack of robust infrastructure and sanitation systems, the region often faces difficulties in controlling the spread of such infections. In particular, the 2013 floods contributed significantly to water contamination which in turn led to a noticeable rise in hepatitis cases in affected areas. The rugged topography and challenges in transportation further complicate healthcare access making timely medical intervention a rarity in many of the region's remote villages(2).

The clinical presentation of Acute Viral Hepatitis A generally includes fever, malaise, jaundice, nausea and abdominal discomfort. Biochemically the infection is marked by significant elevations in liver enzymes especially alanine aminotransferase (ALT) and aspartate aminotransferase (AST) alongside an increase in bilirubin levels(3). In more severe cases complications such as acute liver failure may emerge particularly in individuals with pre-existing liver

conditions or compromised immune systems. Given these manifestations, the disease can be life-threatening if not managed effectively. However, despite the availability of diagnostic tools, timely identification and intervention remain a challenge due to the hilly region's healthcare limitations(4,5).

Demographic factors significantly influence the prevalence, severity, and outcomes of HAV in the hilly regions. Age, gender, occupation, and socio-economic status are critical determinants that shape an individual's susceptibility to infection. In particular, certain professions such as farming and construction expose workers to higher risks of water contamination increasing the likelihood of hepatitis A outbreaks among these groups(6). Moreover epidemiological studies indicate that males in this region exhibit higher rates of infection possibly due to behavioural factors and occupational risks. Gender disparities in infection rates warrant further investigation to better understand the underlying causes and target interventions effectively(7).

The Hilly region's geographical isolation and rugged landscape present formidable challenges to healthcare delivery. In many of the region's remote villages, access to medical care is scarce, with limited transportation options further hindering timely access to healthcare facilities. This results in delayed diagnosis and inadequate treatment which significantly contributes to the high morbidity and mortality associated with HAV infections in these areas. Inadequate healthcare infrastructure coupled with a lack of awareness regarding preventive measures exacerbates the burden of disease making it difficult to curb its spread(8,9).

To combat the recurrent outbreaks of hepatitis A, comprehensive public health interventions are urgently required. Improvements in sanitation, including the provision of clean drinking water and the promotion of good hygiene practices are essential to reduce the risk of waterborne infections(10). Additionally the implementation of hepatitis A vaccination programs could significantly reduce the incidence of the disease, especially in high-risk populations. The integration of vaccination into routine public health campaigns would not only prevent the spread of the virus but also contribute to long-term improvements in the region's overall health(11).

The intricate relationship between clinical manifestations, biochemical markers, and demographic factors underscores the need for a more nuanced understanding of HAV in the hilly regions (12). By analyzing these variables healthcare professionals can develop tailored strategies to mitigate the impact of the disease. This research can guide the allocation of resources, shape public health policies and provide a foundation for targeted interventions that could dramatically improve health outcomes in the region.

Acute Viral Hepatitis A remains a persistent and growing health threat in the Garhwal region of Uttarakhand, strategic interventions focusing on improved sanitation, accessible healthcare, and preventive vaccination hold the potential to reduce the disease burden. A multi-faceted approach that addresses both environmental and healthcare-related factors will be essential for controlling the spread of HAV and safeguarding the health of this vulnerable population. Continued research and collaboration among public health authorities, healthcare providers, and the local community will be pivotal in mitigating the impact of this infectious disease.

Aim of the Study:

This study aims to establish a close association between spring water contamination and the prevalence of Hepatitis A, advocating for the inclusion of Hepatitis A vaccination in routine immunization programs for all children to mitigate the risk of infection.

Objective: To observe prevalence of hepatitis A between spring water and tap water consumers among rural and urban population.

METHODOLOGY

This study adopted a cross-sectional design to observe the association between spring water contamination and the prevalence of Acute Viral Hepatitis A (AVH) in the Garhwal region of Uttarakhand. The primary aim was to analyze the clinical, biochemical, and demographic data of individuals diagnosed with Hepatitis A. The total sample size of 104 patients were added in the study. Patients were taken from OPD and IPD of HNB Base Hospital Srinagar Garhwal and the data was gathered from those who provided informed consent. This approach helped ensure that the study captured individuals from the same geographical and socio-economic backgrounds, thus facilitating the examination of how environmental factors, particularly water contamination, may influence the prevalence of Hepatitis A.

Inclusion Criteria

- Individuals of all genders aged less than 18 years
- Residents of the Garhwal region for at least one year.
- Confirmed positive for IgM anti-HAV antibodies through serological testing.

Exclusion Criteria

- Individuals diagnosed with chronic liver diseases (e.g., cirrhosis, chronic hepatitis B or C).

- Participants with severe comorbidities (e.g., HIV, cancer) that could confound the study's results.
- Individuals who had previously been vaccinated against Hepatitis A or who had undergone antiviral treatment for Hepatitis A.

Data Collection

Data were collected by taking history and laboratory investigation forms. The case recording forms were recorded demographic information including age, gender, occupation, socioeconomic status, and type of residence (rural or urban) and source of water they are using. Clinical details such as presenting symptoms, duration of illness, and presence of complications were noted. Biochemical investigations included serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), total and direct bilirubin, prothrombin time (PT), and international normalized ratio (INR).

Data Analysis

Data were entered and analyzed using statistical software. Descriptive statistics such as mean, standard deviation, frequency, and percentage were calculated for clinical and biochemical variables. The incidence of Hepatitis A was compared between rural and urban populations. Associations between demographic variables and biochemical parameters were evaluated using the Chi-square test and the independent t-test, with a p-value of less than 0.05 considered statistically significant.

RESULTS

Data were collected from 104 participants, out of which 58 (55.8%) were from rural areas and 46 (44.2%) were from urban areas of the Garhwal region.The majority were males, accounting for 60.6% (63 out of 104), indicating a higher incidence among males compared to females (39.4%). Most patients belonged to the younger age group, with 36.5% between 18–25 years and 26.0% between 26–35 years, highlighting that Hepatitis A primarily affected young adults. Only 4.8% of cases were observed in individuals above 60 years of age. Occupationally, the highest proportion of cases were farmers or laborers (35.6%), followed by those employed in the service or office sector (26.9%), students (22.1%), and housewives (15.4%).

Table 1: Distribution of Patients According to Residence and Demographic Characteristics

Age Group (years)	Male	Female	Total (%)	Rural	Urban	Total (%)
1–5	27	19	46 (44.7%)	32	14	46 (44.7%)
6–10	14	18	32 (31.1%)	21	11	32 (31.1%)
11–18	16	9	25 (24.3%)	18	7	25 (24.3%)
Total	**57**	**46**	**103 (100%)**	**71**	**32**	**103 (100%)**

The study population consisted predominantly of children aged 1–5 years (44.7%), showed a slight male predominance (55.3%), and was mainly rural in origin (68.9%). These findings suggest that younger children and those from rural communities constituted the majority of patients included in the study.

Jaundice was the most frequent symptom (94.2%), followed by malaise (88.5%), nausea and vomiting (75.0%), and loss of appetite (67.3%). Abdominal discomfort was present in 61.5% of cases, while fever was recorded in about half of the patients (51.9%). Dark urine was reported by 41.3% of the participants. Hepatic encephalopathy was rare, affecting only 6.7% of patients, indicating that most cases were mild to moderate in severity.

Table 2: Clinical Presentation of Acute Viral Hepatitis A Patients

Clinical Feature	Number of Patients (n = 104)	Percentage (%)
Jaundice	98	94.2
Malaise	92	88.5
Nausea/Vomiting	78	75.0
Loss of appetite	70	67.3
Abdominal discomfort	64	61.5
Fever	54	51.9
Dark urine	43	41.3
Hepatic encephalopathy	7	6.7

The mean SGOT level was 1478.5 ± 955.6 U/L, and the mean SGPT level was 2010.3 ± 840.2 U/L, showing significant hepatic enzyme elevation consistent with acute hepatocellular injury. The mean total bilirubin level was 3.8 ± 1.4 mg/dL, and the mean direct bilirubin level was 2.2 ± 0.9 mg/dL. The average prothrombin time was 13.9 ± 2.6 seconds, and the mean INR was 1.22 ± 0.19, indicating mild coagulopathy in a few cases.

Table 3: Biochemical Parameters of Patients with Acute Viral Hepatitis A

Parameter	Mean ± SD	Minimum	Maximum
SGOT (U/L)	1478.5 ± 955.6	210	4800
SGPT (U/L)	2010.3 ± 840.2	193	4000
Total Bilirubin (mg/dL)	3.8 ± 1.4	0.9	8.5
Direct Bilirubin (mg/dL)	2.2 ± 0.9	0.3	5.2
Prothrombin Time (sec)	13.9 ± 2.6	11.0	23.6
INR	1.22 ± 0.19	0.85	2.00

Among the patients, 23 (22.1%) had markedly elevated SGPT levels (>3000 U/L), while 15 (14.4%) exhibited total bilirubin levels above 5 mg/dL. Elevated INR (>1.5) was seen in 9 (8.7%) cases. Hepatic encephalopathy developed in 7 (6.7%) patients, but there were no deaths reported.

Table 4: Severity Indicators and Complications

Parameter	Frequency (n = 104)	Percentage (%)
SGPT > 3000 U/L	23	22.1
Total Bilirubin > 5 mg/dL	15	14.4
INR > 1.5	9	8.7
Hepatic Encephalopathy	7	6.7
Mortality	0	0

Table 5: Distribution of diagnosis according to water source among rural patients (n = 55)

Diagnosis	Spring water n (%)	Tap water n (%)	Total
AVH	47 (85.5)	8 (14.5)	55
Total	47 (85.5)	8 (14.5)	55 (100.0)

Among rural patients diagnosed with AVH, 85.5% consumed spring water, whereas 14.5% consumed tap water.

Table 6 : Distribution of diagnosis according to water source among urban patients (n = 28)

Diagnosis	Spring water n (%)	Tap water n (%)	Total
AVH	2 (7.1)	26 (92.9)	28
Total	2 (7.1)	26 (92.9)	28 (100.0)

Among urban patients diagnosed with AVH, 92.9% consumed tap water, while 7.1% consumed spring water.

Table 7 : Distribution of diagnosis according to water source among all patients (n = 103)

Diagnosis	Spring water n (%)	Tap water n (%)	Total
AVH	59 (57.3)	41 (39.8)	100*
Missing water source	-	-	3 (2.9)
Overall	59 (57.3)	41 (39.8)	103 (100.0)

Overall, 57.3% of AVH patients used spring water and 39.8% used tap water. Water source information was missing for 3 patients. No statistical test was applicable because all participants had the same diagnosis (AVH).

DISCUSSION

This study aimed to observe the potential association between spring water and the prevalence of Acute Viral Hepatitis A (AVH) in the Garhwal region of Uttarakhand, providing valuable insights into the environmental determinants of this viral infection. The study included 104 participants and focused on evaluating both clinical and biochemical parameters alongside association of viral hepatitis A patients with those taking spring water for consumption. The results of the study revealed no statistically significant differences in liver function markers

(such as SGOT, SGPT, PT, and INR) among patients. These findings of recent studies by Acharya et al., and Adlhoch et al., suggested that while clinical manifestations of Hepatitis A were present, they were not accompanied by significant biochemical disturbances , supporting the notion that the majority of AVH cases in this region may be mild and self-limiting, as observed in previous research (13,14).

The study also sought to observe the possible association between patients consuming spring water and Hepatitis A transmission. While water samples not tested for hepatitis A contamination that's why the study could not conclusively establish a direct causal relationship between water contamination and the incidence of Hepatitis A in the Garhwal region. This outcome aligns with previous studies, such as Guillois et al., and Dalton et al., which identified contaminated water as a potential vector for Hepatitis A but also emphasized the complexity of the disease's transmission(15,16). In contrast, Conrad et al., and Hossain et al., highlighted the critical role of inadequate sanitation in the spread of waterborne diseases, yet noted that other transmission pathways, such as contaminated food and person-to-person contact, could also contribute to outbreaks(15,17). This study, therefore, reinforces the importance of sanitation improvements and safe drinking water initiatives but does not definitively support water contamination as the primary factor in Hepatitis A incidence in this region.

Moreover, the relatively low incidence of hepatic encephalopathy in the AVH group is consistent with the understanding that Hepatitis A, despite its potential for acute liver injury, often remains self-limiting and resolves without causing long-term liver damage(18). The study's findings suggest that while early intervention, including vaccination and symptom management, is crucial, most cases of Hepatitis A can be managed effectively with minimal complications. These results support the findings of previous studies by Posuwan et al., who emphasized that the majority of Hepatitis A cases are mild, particularly in regions with endemic transmission(19).

The implications of this study are far-reaching. While it did not confirm a direct link between spring water contamination and Hepatitis A, it highlights the need for continued focus on water sanitation as a vital component of public health efforts in rural regions. As evidenced by studies such as Sridhar et al., Hepatitis A vaccination programs have been successful in controlling outbreaks in similar settings, making it a crucial part of any intervention strategy in areas with high rates of waterborne diseases(20). The study also calls for enhanced water quality monitoring, especially in rural areas with limited access to safe drinking water.

Future research should focus on more robust longitudinal studies, which can track water contamination levels and Hepatitis A incidence over time, providing clearer evidence of causality. Additionally, environmental health interventions should prioritize both improving water quality and public health education on sanitation practices to further reduce the burden of Hepatitis A in the Garhwal region.

CONCLUSION

It is concluded that Acute Viral Hepatitis A is more prevalent among the rural population of the Garhwal region of Uttarakhand, where inadequate sanitation and consumption of contaminated spring water serve as major risk factors for infection. The disease predominantly affects young children. Most cases presented with classical clinical features including jaundice, malaise, and gastrointestinal symptoms, accompanied by elevated liver enzymes, indicating acute hepatocellular injury. However, the overall course of the disease was mild and self-limiting, with no reported mortality.

REFERENCES

1. Zhang S, Wang J, Yuan Q, Ge S, Zhang J, Xia N, et al. Clinical characteristics and risk factors of sporadic Hepatitis E in central China. Virol J. 2011 Apr 1;8:152.
2. Khuroo MS, Kamili S, Khuroo MS. Clinical course and duration of viremia in vertically transmitted hepatitis E virus (HEV) infection in babies born to HEV-infected mothers. J Viral Hepat. 2009 July;16(7):519–23.
3. Mackinney-Novelo I, Barahona-Garrido J, Castillo-Albarran F, Santiago-Hernández JJ, Méndez-Sánchez N, Uribe M, et al. Clinical course and management of acute hepatitis A infection in adults. Ann Hepatol. 2012;11(5):652–7.
4. Desai H, Ansari AZ, Makwana D, Jadeja D, Gusani J. Clinical-biochemical profile and etiology of acute viral hepatitis in hospitalized young adults at tertiary care center. J Fam Med Prim Care. 2020;9(1):247.
5. Murhekar MV, Ashok M, Kanagasabai K, Joshua V, Ravi M, Sabarinathan R, et al. Epidemiology of Hepatitis A and Hepatitis E Based on Laboratory Surveillance Data-India, 2014-2017. Am J Trop Med Hyg. 2018 Oct;99(4):1058–61.
6. Perseghin P, Balduini CL, Piccolo G, Bertolino G, Bellusci M, Scelsi R, et al. Guillain-Barré syndrome with autoimmune hemolytic anemia following acute viral

hepatitis. Ital J Neurol Sci. 1985 Dec;6(4):447–50.
7. Lin SM, Chu CM, Shih LY, Liaw YF. [Hematological abnormalities in acute viral hepatitis and acute hepatitis in HBsAg carrier]. Chang Yi Xue Za Zhi. 1991 Dec;14(4):253–8.
8. Webb GW, Kelly S, Dalton HR. Hepatitis A and Hepatitis E: Clinical and Epidemiological Features, Diagnosis, Treatment, and Prevention. Clin Microbiol Newsl. 2020 Nov;42(21):171–9.
9. Jeong SH, Lee HS. Hepatitis A: clinical manifestations and management. Intervirology. 2010;53(1):15–9.
10. Gumber SC, Chopra S. Hepatitis C: a multifaceted disease. Review of extrahepatic manifestations. Ann Intern Med. 1995 Oct 15;123(8):615–20.
11. Teshale EH, Howard CM, Grytdal SP, Handzel TR, Barry V, Kamili S, et al. Hepatitis E epidemic, Uganda. Emerg Infect Dis. 2010 Jan;16(1):126–9.
12. Thom K, Gilhooly P, McGowan K, Malloy K, Jarvis LM, Crossan C, et al. Hepatitis E virus (HEV) in Scotland: evidence of recent increase in viral circulation in humans. Euro Surveill Bull Eur Sur Mal Transm Eur Commun Dis Bull. 2018 Mar;23(12):17–00174.
13. Acharya KS, Kumar Sharma P, Singh R, Kumar Mohanty S, Madan K, Kumar Jha J, et al. Hepatitis E virus (HEV) infection in patients with cirrhosis is associated with rapid decompensation and death. J Hepatol. 2007 Mar;46(3):387–94.
14. Adlhoch C, Avellon A, Baylis SA, Ciccaglione AR, Couturier E, de Sousa R, et al. Hepatitis E virus: Assessment of the epidemiological situation in humans in Europe, 2014/15. J Clin Virol Off Publ Pan Am Soc Clin Virol. 2016 Sept;82:9–16.
15. Guillois Y, Abravanel F, Miura T, Pavio N, Vaillant V, Lhomme S, et al. High Proportion of Asymptomatic Infections in an Outbreak of Hepatitis E Associated With a Spit-Roasted Piglet, France, 2013. Clin Infect Dis Off Publ Infect Dis Soc Am. 2016 Feb 1;62(3):351–7.
16. Dalton HR, Bendall RP, Rashid M, Ellis V, Ali R, Ramnarace R, et al. Host risk factors and autochthonous hepatitis E infection. Eur J Gastroenterol Hepatol. 2011 Nov;23(12):1200–5.
17. Hossain MS, Alam MR, Hasan MI, Sharif JU, Kabir MA, Islam MA, et al. Prevalence of Serological Markers of Viruses in Patients of Acute Hepatitis. Mymensingh Med J MMJ. 2019 Apr;28(2):278–85.
18. Gordon SC, Reddy KR, Schiff L, Schiff ER. Prolonged intrahepatic cholestasis secondary to acute hepatitis A. Ann Intern Med. 1984 Nov;101(5):635–7.
19. Posuwan N, Vuthitanachot V, Chinchai T, Wasitthankasem R, Wanlapakorn N, Poovorawan Y. Serological evidence of hepatitis A, B, and C virus infection in older adults in Khon Kaen, Thailand and the estimated rates of chronic hepatitis B and C virus infection in Thais, 2017. PeerJ. 2019;7:e7492.
20. Sridhar S, Yip CCY, Wu S, Chew NFS, Leung KH, Chan JFW, et al. Transmission of Rat Hepatitis E Virus Infection to Humans in Hong Kong: A Clinical and Epidemiological Analysis. Hepatol Baltim Md. 2021 Jan;73(1):10–22.

How to cite this article: Ankita Giri, Chandra Madhur Sharma, Meenakshi Rawat, CLINICO BIOCHEMICAL FEATURES OF ACUTE VIRAL HEPATITIS A PATIENTS IN RELATION TO DEMOGRAPHIC FACTORS IN HILLY AREAS OF GARHWAL REGION OF UTTARAKHAND, Asian J. Med. Res. Health Sci., 2026; 4 (2):1678-1683.

Source of Support: Nil, Conflicts of Interest: None declared.