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Etiological Spectrum and Clinical Outcomes of Patients Admitted with Acute Viral Hepatitis: A Retrospective Study

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ABSTRACT

Background: Acute viral hepatitis poses a significant health burden in urban Pakistan, especially Karachi, due to poor sanitation and limited healthcare infrastructure, highlighting the need to understand its causes, clinical features, and outcomes.

Methods: A retrospective observational study was conducted at Hamdard University Hospital, Karachi, Pakistan, from January 2020 to July 2023. Patients of all ages with a confirmed diagnosis of acute viral hepatitis were included using non-probability consecutive sampling. Data were collected from medical records, including demographics, clinical symptoms, laboratory parameters such as Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), and bilirubin level, along with the outcomes. Patients were categorized based on the etiologies of hepatitis A, B, and E. Data were analyzed using SPSS v25, with appropriate statistical tests applied based on variable type and distribution. A p-value <0.05 was considered statistically significant.

Results: Out of 276 patients, hepatitis A accounted for 173 (62.9%) cases, followed by hepatitis E 93 (33.8%) and hepatitis B 9 (3.3%). The mean age of patients was 19.14 ±3.18 years, with a significant male predominance in hepatitis A 72 (70.6%) and a higher female prevalence in hepatitis E 72 (41.1%). The mean ALT, AST, and bilirubin levels were 1562.15 ±744.49 U/L, 1358.42 ±682.41 U/L, and 7.21 ±3.85 mg/dL, respectively, with no significant differences across etiologies. Liver failure occurred in 17 (6.2%) of cases, and 28 (10.2%) required intensive care unit admission. The majority of the hepatitis cases were reported in August (53, 19.27%), September (37, 13.45%), and July (36, 13.09%), corresponding to the monsoon periods.

Conclusion: Hepatitis A and E were the leading causes of acute viral hepatitis among hospitalized patients.

Keywords: Hepatitis A, Hepatitis B, Hepatitis E, Liver Function Tests, Epidemiology.

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INTRODUCTION

Acute viral hepatitis remains a significant public health concern globally, contributing substantially to morbidity and mortality[1,2]. It is predominantly caused by hepatotropic viruses, including hepatitis A virus (HAV), hepatitis B virus (HBV), and hepatitis E virus (HEV)2. These viruses, differing in transmission routes and clinical presentations, impose diverse challenges to public health systems, particularly in developing countries[3,4]. Hepatitis A and E are primarily transmitted via the fecal-oral route, commonly associated with poor sanitation and unsafe drinking water, while hepatitis B spreads through bloodborne pathways, including unsafe medical practices and perinatal transmission[4].

The prevalence of viral hepatitis is startlingly high in Pakistan. Because hepatitis A and E are widespread, contaminated water sources and inadequate sewage systems are commonly associated with outbreaks[5]. Conversely, HBV is classified as having a moderate prevalence, affecting around 2% of the population[6]. While HEV mostly affects young adults and has a higher risk of acute hepatitis, particularly in pregnant women, HAV primarily affects younger populations and is frequently self-limiting [7,8]. On the other hand, acute HBV infections can develop into chronic illnesses that lead to long-term problems like cirrhosis and hepatocellular cancer[9].

There is little local data on the clinical features of acute viral hepatitis in Pakistan, despite a wealth of research on the prevalence of viral hepatitis worldwide. Understanding the epidemiology of these diseases is crucial in Karachi, an urban center with a high population density and serious public health issues. In order to better understand etiological variations and identify factors that contribute to unfavorable outcomes, this study aimed to examine the clinical and laboratory profiles of patients in Karachi who presented with acute viral hepatitis. This study aimed to evaluate the etiology, clinical presentations, laboratory findings, and outcomes of patients admitted with acute viral hepatitis.

METHODS

This retrospective observational study was conducted at Hamdard University Hospital, Karachi, including patients admitted with a confirmed diagnosis of acute viral hepatitis between 1st January 2020 and 31st July 2023. Ethical approval was obtained from the institutional ethics review committee of Hamdard University Hospital (Ref #: HCM&D/668/2024).

The study adhered to the Declaration of Helsinki, and all patient data were anonymized to maintain confidentiality. Only authorized personnel handled data to ensure privacy and security.

The diagnosis was based on clinical presentation, laboratory results, and serological evidence of hepatitis A, B, or E. Data were collected from the medical records department after approval from the institutional ethics review board.

Patients of all ages with a confirmed diagnosis of acute viral hepatitis were included. Acute viral hepatitis was defined as sudden-onset liver inflammation due to hepatitis A, B, or E viruses, characterized by elevated liver enzymes, hyperbilirubinemia, and positive serological markers specific to the virus. Patients with incomplete medical records, co-infections with other types of hepatitis viruses, or pre-existing chronic liver diseases were excluded.

Epi Info sample size calculator is used for the estimation of sample size. The prevalence of hepatitis B in a previous Pakistani study was 23.4%[10], confidence interval 95%, and a margin of error 5%. The estimated sample size came out to be 275. All patients were enrolled through non-probability consecutive sampling.

Data collection involved a detailed review of patient records and included demographic, clinical, laboratory, and hospital admission variables. Demographic data encompassed age, gender, and family history of hepatitis, defined as a documented history of hepatitis in immediate family members. Clinical variables included symptoms such as vomiting, jaundice, fever, abdominal pain, irritability, and anorexia. Laboratory data comprised serum glutamic pyruvic transaminase (SGPT), serum glutamic oxaloacetic transaminase (SGOT), bilirubin levels, and prothrombin time/international normalized ratio (PT/INR). Hospitalization details included the type of admission (ward or ICU), length of hospital stay defined as the total number of days from admission to discharge or death, and clinical outcomes such as liver failure. Liver failure was operationally defined as the presence of jaundice, coagulopathy with PT/INR greater than 1.5, and hepatic encephalopathy in the absence of chronic liver disease. Viral serology results identified the causative agents and categorized patients into groups based on hepatitis A, B, or E.

Data were anonymized and entered into Microsoft Excel, followed by statistical analysis using SPSS version 25. Continuous variables were summarized using means and standard deviations or medians with interquartile ranges, depending on their distribution. Categorical variables were reported as frequencies and percentages. Comparative analyses were performed to assess variations in clinical and laboratory findings across different etiologies and outcomes. Independent t-tests or Mann–Whitney U tests were used for continuous variables, and chi-square or Fisher's exact tests for categorical variables. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Comparison of Causes of Acute Viral Hepatitis with Sociodemographic and Clinical Presentations (N=275)

Variables	Total (n= 275)	Hepatitis A (n= 173)	Hepatitis B (n= 9)	Hepatitis E (n= 93)	p-value
Mean Age					
Years	19.14 ±3.18	18.94 ±3.29	20.01 ±1.50	19.44 ±3.07	0.334
15-18 years	136	92 (67.6)	3 (2.2)	41 (30.1)	0.035
19-22 years	87	45 (51.7)	6 (6.9)	36 (41.4)	
>22 years	52	36 (69.2)	0 (0)	16 (30.8)	
Gender					
Male	102	72 (70.6)	9 (8.8)	21 (21.0)	<0.001
Female	173	101 (57.7)	2 (1.1)	72 (41.1)	
Family History of Hepatitis					
n(%)	125	74 (59.2)	7 (5.6)	44 (35.2)	0.110
Clinical Presentations					
Vomiting	149	89 (59.7)	7 (4.7)	53 (4.7)	0.242
Jaundice	57	38 (66.7)	2 (3.5)	17 (29.8)	0.774
Fever	61	46 (75.4)	3 (4.9)	12 (19.7)	0.027
Abdominal Pain	23	15 (65.2)	3 (13.0)	5 (21.7)	0.015
Irritability	8	6 (75.0)	2 (25.0)	0 (0)	0.001
Anorexia	42	17 (40.5)	2 (4.8)	23 (54.8)	0.005

All data presented as number (%), Chi-Square/Fisher-Exact test applied, p-value ≤0.05 considered as significant

A total of 275 patients with acute viral hepatitis were included in the study, with 173 cases (62.9%) of hepatitis A, 93 cases (33.8%) of hepatitis E, and 9 cases (3.3%) of hepatitis B. The mean age of patients was 19.14 ± 3.18 years, with no significant difference across the etiology (p=0.334). The majority of hepatitis A cases, 92 (67.6%), were observed in the 15–18-year age group, whereas hepatitis E was most frequent in the 19–22-year age group, 36 (41.4%) (p=0.035). Gender distribution was significantly different (p<0.001), with hepatitis A predominantly affecting males 72 (70.6%) and hepatitis E more prevalent among females 72 (41.1%). Clinical symptoms varied across etiologies. Fever and irritability were significantly more common in hepatitis A 46 (75.4%) (p=0.027) and hepatitis E 6 (75.0%) (p=0.001). Anorexia was more prevalent in hepatitis E 23 (54.8%) (p=0.005). Other symptoms, including vomiting and jaundice, did not show statistically significant differences in Table **1.**

Table 2: Comparison of Laboratory Parameters with Causes of Acute Viral Hepatitis (n=275)

Variables	Total (n=275)	Hepatitis A (n= 173)	Hepatitis B (n= 9)	Hepatitis E (n= 93)	p-value
ALT, U/L	1562.15 ±744.49	1626.47 ±823.36	1616.67 ±334.48	1437.20 ±591.42	0.138
<500 U/L	3	0 (0)	0 (0)	3 (100)	0.179
500-999 U/L	53	35 (66.0)	0 (0)	18 (34.0)	
1000-1999 U/L	146	92 (63.0)	7 (4.8)	47 (32.2)	
≥2000 U/L	73	46 (63.0)	2 (2.7)	25 (34.2)	
AST, U/L	1358.42 ±682.41	1416.21 ±749.44	1200.01 ±178.33	1266.24 ±562.82	0.181
<500 U/L	24	14 (58.3)	0 (0)	10 (41.7)	0.549
500-999 U/L	72	44 (61.1)	2 (2.8)	26 (36.1)	
1000-1999 U/L	140	87 (62.1)	7 (5.0)	46 (32.9)	
≥2000 U/L	39	28 (71.8)	0 (0)	11 (28.2)	
Serum Bilirubin level, mg/dL	7.21 ±3.85	7.16 ±3.61	6.89 ±2.56	7.32 ±4.38	0.918
<2 mg/dL	9	9 (100)	0 (0)	0 (0)	0.223
2-5 mg/dL	89	54 (60.7)	2 (2.2)	33 (37.1)	
5-10 mg/dL	121	71 (58.7)	5 (4.1)	45 (37.2)	
>10 mg/dL	56	39 (69.6)	2 (3.6)	15 (26.8)	
PT/INR	1.35 ±0.43	1.32 ±0.41	1.33 ±0.35	1.42 ±0.47	0.149
≤1.2	106	76 (71.7)	4 (3.8)	26 (24.5)	0.288
1.3-1.5	104	61 (58.7)	3 (2.9)	40 (38.5)	
1.6-2.0	51	28 (54.9)	2 (3.9)	21 (41.2)	

ALT: Alanine Aminotransferase, AST: Aspartate Aminotransferase, INR: International Normalized Ratio, PT: Prothrombin Time. All data presented as number (%), Chi-Square/Fisher-Exact test applied, p-value ≤0.05 considered as significant

The mean ALT (SGPT) level across the cohort was 1562.15 ± 744.49 U/L, with no significant differences among hepatitis A, B, and E cases (p=0.138). ALT levels ≥2000 U/L were observed in 46 (63.0) of hepatitis A cases and 25 (34.2%) of hepatitis E cases. AST (SGOT) levels followed a similar trend, with a mean of 1358.42 ± 682.41 U/L and no significant intergroup variation (p=0.181).

Serum bilirubin levels were also elevated, with a mean of 7.21 ± 3.85 mg/dL, and no significant differences across the groups (p=0.918). Hepatitis A patients had the highest proportion of bilirubin levels >10 mg/dL, i.e., 39 (69.6%). The mean PT/INR was 1.35 ± 0.43, with no statistically significant differences among the groups (p=0.149) **Table 2**.

Table 3: Year and Month Wise Comparison of Causes of Acute Viral Hepatitis (N=275)

Variables	Total (n=275)	Hepatitis A (n= 173)	Hepatitis B (n= 9)	Hepatitis E (n= 93)	p-value
Years					
2020	36	24 (66.7)	2 (5.6)	10 (27.8)	0.020
2021	51	36 (70.6)	2 (3.9)	13 (25.5)	
2022	110	58 (52.7)	1 (0.9)	51 (46.4)	
2024	78	55 (70.5)	4 (5.1)	19 (24.4)	
Months					
January	12	8 (66.7)	0 (0)	4 (33.3)	0.141
February	7	4 (57.1)	0 (0)	3 (42.9)	
March	8	6 (75.0)	0 (0)	2 (25.0)	
April	20	16 (80.0)	1 (5.0)	3 (15.0)	
May	13	6 (46.2)	2 (15.4)	5 (38.5)	
June	26	12 (46.2)	1 (3.8)	13 (50.0)	
July	36	28 (77.8)	1 (2.8)	7 (19.4)	
August	53	32 (60.4)	3 (5.7)	18 (34.0)	
September	37	16 (43.2)	1 (2.7)	20 (54.1)	
October	27	19 (70.4)	0 (0)	8 (29.6)	
November	20	15 (75.0)	0 (0)	5 (25.0)	
December	16	11 (68.8)	0 (0)	5 (31.3)	

All data presented as number (%), Chi-Square/Fisher-Exact test applied, p-value ≤0.05 considered as significant.

There was a significant variation in the annual distribution of cases (p=0.020). Hepatitis A cases were most common in 2024, i.e., 55 (70.5%), while hepatitis E was more prevalent in 2022, i.e., 51 (46.4%). Monthly distribution did not show a statistically significant difference (p=0.141), but hepatitis A cases were higher on July 28 (77.8%) and December 11 (68.8%), while hepatitis E peaked on September 20 (54.1%) **Table 3.**

Table 4: Comparison of Causes of Acute Viral Hepatitis with Hospitalization

Variable	Total (n=275)	Hepatitis A (n= 173)	Hepatitis B (n= 9)	Hepatitis E (n= 93)	p-value
Admission					
Intensive Care Unit	28	14 (50.0)	2 (7.1)	12 (42.9)	0.223
Ward	247	159 (64.4)	7 (2.8)	81 (32.8)	
Liver Failure					
Yes	17	10 (58.8)	1 (5.9)	6 (35.3)	0.804
No	258	163 (63.2)	8 (3.1)	87 (33.7)	

Mean Length of Hospital Stay					
Days	2.99 ±1.53	2.97 ±1.52	2.78 ±0.83	3.03 ±1.61	0.875
≤3	199	125 (62.8)	7 (3.5)	67 (33.7)	0.933
>3	76	48 (63.2)	2 (2.6)	26 (34.2)	

All data presented as number (%), Chi-Square/Fisher-Exact test applied, p-value ≤0.05 considered as significant.

Among the 275 patients, 28 (10.2%) required ICU admission, with no significant differences among hepatitis types (p=0.223). Liver failure was observed in 17 cases (6.2%), predominantly in hepatitis A 10 (58.8%), but without statistical significance (p=0.804). The mean length of hospital stay was 2.99 ± 1.53 days, with no significant intergroup differences (p=0.875). Short hospital stays (≤3 days) were observed in 199 (72.4%) cases, irrespective of etiology **Table 4**.

DISCUSSION

This study provides a comprehensive analysis of the sociodemographic, clinical, and laboratory profiles of patients with acute viral hepatitis in Karachi, Pakistan. The findings indicate that hepatitis A was the most prevalent cause of acute viral hepatitis in this study (62.9%), followed by hepatitis E (33.8%) and hepatitis B (3.3%). These results are consistent with previous research from Pakistan, which also reported HAV and HEV as the dominant etiological agents of acute viral hepatitis in the country[5,11,12,13]. In a review article, a similar predominance of HAV and HEV in young populations in Pakistan was observed, while HBV accounted for a smaller proportion of acute cases due to its tendency to progress into chronic infection rather than presenting as an acute illness 4. Globally, HEV is the emerging cause of sporadic acute viral hepatitis in regions with poor water sanitation, and this study reinforces similar trends in Pakistan[14,15,16]. However, the low prevalence of HBV (3.3%) in this study contrasts with studies from other regions of Pakistan, such as Punjab, where HBV prevalence was reported to be higher[17].

The mean age of patients in this study was [19.14] years, indicating that acute viral hepatitis predominantly affects younger individuals in Karachi. This is consistent with findings from a previous study that reported a high prevalence of HAV and HEV in younger populations in Pakistan, largely due to poor sanitation and hygiene practices[4].

Gender differences were also observed, with hepatitis A more common among males (70.6%) and hepatitis E among females (41.1%). This gender disparity aligns with studies conducted in both Pakistan and other regions, where male exposure to outdoor activities and environmental risks increases their likelihood of acquiring HAV, while cultural and household dynamics might expose females more frequently to HEV in certain contexts[7].

Fever was significantly more common in hepatitis A patients (75.4%, p=0.027), consistent with the systemic inflammatory response typical of HAV infections. Hepatitis E, on the other hand, was more strongly associated with irritability and anorexia, as noted in other studies from Pakistan and other developing countries[7,18]. In comparison, hepatitis B cases showed a lower frequency of most symptoms, reflecting either milder acute presentations or delayed recognition in the acute phase.

Elevated ALT and AST levels were observed across all etiologies, with no significant differences among hepatitis A, B, and E cases. This is even consistent with study from neighboring country as well, which documented similar patterns of liver enzyme elevation[19].

The study identified a significant difference in yearly trends (p=0.020), with hepatitis A cases peaking in 2024 and hepatitis E in 2022. This observation aligns with prior research that identified periodic outbreaks of hepatitis A and E in Pakistan, particularly linked to monsoon-driven water contamination[10]. Although monthly distribution did not reach statistical significance, the highest hepatitis A cases in July and December reflect known seasonal patterns associated with rainfall and post-monsoon waterborne disease outbreaks.

The strengths of this study include its large sample size, comprehensive clinical and laboratory data, and its focus on Karachi, a high-burden urban center. These factors enhance the applicability of the findings to other urban settings in Pakistan, particularly those with similar sociodemographic and healthcare challenges. However, several limitations warrant consideration. The single-center and retrospective nature of the study design restricts the generalizability of the results. Moreover, the absence of viral genotyping limits the ability to assess strain-specific epidemiology and clinical patterns, particularly for HEV and HBV. Additionally, the lack of data on co-infections or underlying liver

diseases may underestimate the complexity of cases.

To address these limitations, future studies should adopt a multi-center design that includes both urban and rural populations to capture regional variations in the epidemiology and outcomes of acute viral hepatitis. To assess long-term outcomes like chronicity, development to cirrhosis, and overall disease burden, prospective studies are required. Using viral genotyping could yield important information about strain-specific trends, which would be very helpful in creating focused public health campaigns [20,21,22]. Emerging evidence highlights the importance of anatomical factors in the progression of liver dysfunction. For instance, anatomical variations in hepatic vasculature, as identified in studies on celiac trunk and hepatic artery variants in the Pakistani population, may influence liver perfusion during acute injury. Additionally, deviations from normal hepatic and splenic parameters, often observed in cases with significant liver enzyme elevations, may contribute to the severity of liver dysfunction in acute viral hepatitis [23,24,25]. The goal of future treatments should be to reduce the amount of time needed for therapy while maintaining the highest level of safety[8].

CONCLUSION

This study identifies hepatitis A and E as the leading etiologies of acute viral hepatitis in Karachi, with hepatitis B contributing less frequently. The majority of patients experienced significant liver dysfunction, reflected by elevated liver enzymes and bilirubin levels, with a minority developing liver failure or requiring intensive care.

LIST OF ABBREVIATIONS

ALT: Alanine Aminotransferase
AST: Aspartate Aminotransferase
HAV: Hepatitis A Virus
HBV: Hepatitis B Virus
HEV: Hepatitis E Virus
ICU: Intensive Care Unit
PT/INR: Prothrombin Time/International Normalized Ratio
SGOT: Serum Glutamic Oxaloacetic Transaminase
SGPT: Serum Glutamic Pyruvic Transaminase

FUNDING

None

CONFLICT OF INTEREST

None

ETHICAL APPROVAL

Ethical approval was obtained from the institutional ethics review committee of Hamdard University Hospital (Ref #: HCM&D/668/2024).

AUTHORS' CONTRIBUTION

AS, AA: Conception and design of the study, manuscript writing, and critical review of the manuscript. **MR & SSA:** Manuscript writing and critical review of the manuscript. All authors approved the final version of the manuscript for publication.

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