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Original Research Article

Retrospective Evaluation of Biochemical Profile Among Patients with Viral Hepatitis Attending a Tertiary Care Hospital

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Abstract:

Background: Viral hepatitis is a major public health concern and an important cause of acute and chronic liver disease worldwide. Biochemical investigations are essential for assessing hepatic injury, establishing diagnosis, and monitoring disease progression, particularly in resource-limited healthcare settings.

Aim: To retrospectively evaluate the biochemical profile among patients with viral hepatitis attending a tertiary care hospital.

Methodology: A retrospective observational study was conducted in the Department of Biochemistry at Netaji Subhas Medical College and Hospital in Bihta, Patna, Bihar, India, over three months. Hospital records of 110 patients aged 12 years and above with serologically confirmed viral hepatitis were reviewed. Demographic details, clinical features, biochemical parameters, and serological findings were collected and analyzed using SPSS version 26.0.

Results: Hepatitis B was the predominant viral infection. Viral hepatitis was more common among young and middle-aged adults, with male predominance. Jaundice and fatigue were the most frequent clinical manifestations. Biochemical evaluation revealed marked elevations in liver enzymes and bilirubin, indicating significant hepatocellular injury, while renal function remained largely preserved.

Conclusion: Viral hepatitis is associated with significant biochemical alterations reflecting hepatic injury. Routine biochemical evaluation is valuable for early diagnosis, disease monitoring, and guiding effective clinical management.

Keywords: Viral hepatitis, biochemical profile, liver function tests, ALT, AST, bilirubin, retrospective study, tertiary care hospital.

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Introduction

Viral Hepatitis is one of the major causes of morbidity and mortality in liver disease and still a big public health problem especially in developing countries like India. Hepatitis is an umbrella term for the inflammation of the liver and is caused by a hepatitis virus group called hepatotropic viruses, including Hepatitis A virus (HAV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Hepatitis D virus (HDV) and Hepatitis E virus (HEV) [1]. The viruses vary in respect of their means of transmission, epidemiology, course of disease, and long-term clinical consequences. Clinical signs are highly variable and non-specific and can be confused with those of other liver diseases and thus cannot be used for the accurate diagnosis of viral hepatitis. So, laboratory tests such as biochemical parameters and viral serological markers are important to confirm the diagnosis and to determine the severity of liver damage [2]. Despite significant progress in vaccination, screening and antiviral treatment, the global burden of viral hepatitis is still great.

The World Health Organization (WHO) estimates that about 354 million people are infected with chronic B or C hepatitis infection and viral hepatitis causes almost 1.3 million deaths every year, mainly from liver cirrhosis and hepatocellular carcinoma (HCC) [3]. Hepatitis B and C are responsible for the

overwhelming majority of chronic liver diseases worldwide while hepatitis A and E are key causes of acute viral hepatitis, especially in areas of poor sanitation and limited access to clean drinking water [4]. Viral hepatitis continues to be an important health problem and early diagnosis and clinical management is required. Viral hepatitis epidemiology is different across different geographic areas, different social-economic status, vaccination coverage and health care system.

Hepatitis A virus (HAV) and hepatitis E virus (HEV) are fecal-oral viruses, typically spread by contaminated food and water and more prevalent in developing countries [5]. On the other hand, hepatitis B virus (HBV), hepatitis C virus (HCV) and hepatitis D virus (HDV) are transmitted primarily from person to person via infected blood or body fluids such as unsafe injection, blood transfusion, sharing of needles, and mother-to-child transmission. HBV and HCV still account for a significant proportion of the burden of chronic liver disease in India, and HEV is still one of the most frequent causes of acute hepatitis outbreaks, especially in the monsoon season [6]. The clinical manifestation of viral hepatitis can be asymptomatic, acute hepatitis or chronic progressive liver disease.

The most frequent symptoms include fever, malaise, fatigue, anorexia, nausea, vomiting, abdominal discomfort, dark urine and jaundice [7]. A significant number of people will recover completely after acute infection, but some people, especially those with HBV and HCV infection, will become chronic with chronic hepatitis, liver fibrosis and cirrhosis, portal hypertension, liver failure and hepatocellular carcinoma. Biochemical investigations are important to help define the extent of hepatocellular injury, cholestasis and hepatic synthetic function, beyond what is seen clinically, and therefore are helpful in determining the severity of the disease [8]. Biochemical parameters are important tools for the diagnosis, monitoring and prognosis of viral hepatitis. Commonly used liver function tests (LFTs) include serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), total bilirubin and direct bilirubin, serum albumin, total protein and prothrombin time, which help to determine liver damage and functional capacity [9]. Raised ALT and AST is a sign of hepatocellular damage while raised bilirubin is due to bilirubin metabolism disturbance and cholestasis.

High ALP and/or low serum albumin, and/or a prolonged prothrombin time, can suggest liver synthetic failure, especially in the more severe liver disease [10]. The pattern and degree of these biochemical abnormalities often run in parallel with the severity of the disease and could aid physicians in monitoring therapeutic response and outcome. It has been found that biochemical parameters vary according to the type and stage of viral hepatitis by several studies. Transaminase levels are typically high in acute viral hepatitis while chronic hepatitis may be associated with a gradual rise in transaminases with relative lower levels and a gradual decline of hepatic synthetic function [11].

Biochemical markers, therefore, can be used to assess the disease regularly, and this will help identify the progression of the disease at an early stage, intervene treatment in time, and prevent the occurrence of serious complications. In addition, biochemical investigation is cheap, readily available and informative; it is an essential part of routine clinical practice, especially in resource poor healthcare settings. The burden of viral hepatitis remains high in India due to its large population, inequitable access to healthcare, differences in levels of vaccination coverage, and sanitation [12]. While there are few epidemiological studies undertaken to assess the prevalence and the clinical spectrum of the viral hepatitis in various parts of the country, biochemical profile of the viral hepatitis patients attending tertiary care hospitals of eastern India is comparatively less. Geographical differences in the epidemiology of disease, nutritional and socioeconomic conditions and health seeking behavior may affect biochemical abnormalities and clinical outcomes. Thus, there is a need to generate evidence to guide diagnostic choices and best possible management of patients [13].

The growing prevalence of viral hepatitis and the significance of biochemical investigations in the evaluation of the disease prompted the present retrospective study to evaluate biochemical profile of the patient suffering from viral hepatitis admitted in the department of Medicine, Tertiary Care hospital, Bihta, Patna, Bihar, India. The objective of the study is to highlight the liver function abnormalities in patients with viral hepatitis and to provide region-specific data which can help the clinicians in early detection, follow-up of the disease and evidence-based management. The results will provide better knowledge of biochemical changes associated with viral hepatitis and help develop strategies that will help lower morbidity and mortality rates from liver disease in the study population.

Materials and Methods

Study Design: This was a retrospective observational study conducted to evaluate the biochemical profile among patients diagnosed with viral hepatitis attending a tertiary care hospital.

Study Area: The study was carried out at the Department of Biochemistry in Netaji Subhas Medical College and Hospital in Bihta, Patna, Bihar, India.

Study Duration: The study was conducted over a period of 3 months.

Sample Size: A total of 110 patients with confirmed viral hepatitis were included in the study based on

the availability of complete clinical, biochemical, and serological records.

Sample Population: The study population consisted of patients aged 12 years and above who were diagnosed with viral hepatitis (HAV, HBV, HCV, HEV, or HDV) and had undergone routine biochemical and serological investigations at the tertiary care hospital during the study period.

Data Collection: Data were collected retrospectively from hospital medical records, laboratory registers, and electronic patient records using a structured data collection form. Information regarding demographic characteristics, presenting clinical features, biochemical investigations, liver function tests, renal function tests, complete blood count, blood glucose levels, urine examination, and viral serological findings was extracted. Only records with complete biochemical and serological information were included for analysis.

Inclusion Criteria

- Patients aged 12 years and above.
- Patients diagnosed with viral hepatitis based on compatible clinical features and positive serological markers for HAV, HBV, HCV, HEV, or HDV.
- Patients with complete biochemical and laboratory investigation records.

Exclusion Criteria

- Patients are diagnosed with non-viral liver diseases such as drug-induced hepatitis, alcoholic liver disease, autoimmune hepatitis, non-alcoholic fatty liver disease, or metabolic liver disorders.
- Patients with incomplete medical records or missing biochemical investigations.
- Patients with known chronic systemic illnesses significantly affect liver biochemical parameters.

Study Procedure: Hospital records of eligible patients with serologically confirmed viral hepatitis were reviewed retrospectively. Demographic details, clinical presentation, and laboratory findings were recorded using a standardized data extraction form. Biochemical parameters including serum bilirubin (total and direct), alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), total protein, serum albumin, blood urea, serum creatinine, and blood glucose were collected from laboratory records. Serological diagnosis of viral hepatitis was confirmed using appropriate markers including anti-HAV IgM, HBsAg, anti-HCV antibodies, anti-HEV IgM, and anti-HDV IgM. Where available, ultrasonography findings were also reviewed to support the clinical diagnosis.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Comparisons between categorical variables were performed using the Chi-square test, while continuous variables were analyzed using the Student's t-test or one-way analysis of variance (ANOVA) wherever appropriate. A p-value <0.05 was considered statistically significant. The findings were presented in the form of tables and charts to facilitate interpretation of biochemical abnormalities among patients with viral hepatitis".

Result

Table 1 shows the demographic distribution of the study participants. A total of 110 patients with viral hepatitis were included, with a mean age of 39.8 ± 14.6 years. The majority of patients belonged to the 21–40 years age group (40.0%), followed by 41–60 years (32.7%), indicating that viral hepatitis was more common among young and middle-aged adults. Male patients (61.8%) outnumbered females (38.2%), suggesting a higher prevalence of viral hepatitis among males in the study population.

Table 1: Demographic Characteristics of Study Participants (N = 110)

Variable	Frequency (n)	Percentage (%)
Age Group (Years)		
12–20	12	10.9
21–40	44	40
41–60	36	32.7
>60	18	16.4
Gender		
Male	68	61.8
Female	42	38.2

Table 2 presents the distribution of different types of viral hepatitis among the study participants. Hepatitis B virus (HBV) infection was the most common, affecting 41.8% of patients, followed by Hepatitis C virus (HCV) (21.8%), Hepatitis E virus (HEV) (16.4%), Hepatitis A virus (HAV) (14.5%), and Hepatitis D virus (HDV) (5.5%). These findings indicate that HBV remains the predominant form of

viral hepatitis among patients attending the tertiary care hospital.

Table 2: Distribution of Types of Viral Hepatitis (N = 110)		
Type of Viral Hepatitis	**Frequency (n)**	**Percentage (%)**
Hepatitis A (HAV)	16	14.5
Hepatitis B (HBV)	46	41.8
Hepatitis C (HCV)	24	21.8
Hepatitis E (HEV)	18	16.4
Hepatitis D (HDV)	6	5.5

Table 3 summarizes the common clinical manifestations observed among patients with viral hepatitis. Jaundice (74.5%) was the most frequently reported symptom, followed by weakness/fatigue (70.9%), loss of appetite (59.1%), dark urine (52.7%), nausea/vomiting (49.1%), abdominal pain (43.6%), and fever (35.5%). These findings demonstrate that jaundice and constitutional symptoms were the predominant clinical features among patients with viral hepatitis.

Table 3: Clinical Presentation of Patients with Viral Hepatitis (N = 110)		
Clinical Feature	**Frequency (n)**	**Percentage (%)**
Jaundice	82	74.5
Weaknesses/Fatigue	78	70.9
Loss of Appetite	65	59.1
Nausea/Vomiting	54	49.1
Abdominal Pain	48	43.6
Fever	39	35.5
Dark Urine	58	52.7

Table 4 depicts the biochemical profile of patients with viral hepatitis. The mean serum ALT (352.8 ± 141.7 U/L) and AST (286.4 ± 118.5 U/L) levels were markedly elevated above the normal reference range, indicating significant hepatocellular injury. The mean total bilirubin (4.82 ± 2.31 mg/dL) and direct bilirubin (2.46 ± 1.28 mg/dL) levels were also elevated, reflecting impaired bilirubin metabolism. Serum ALP (198.6 ± 69.4 U/L) showed moderate elevation, while the mean serum albumin (3.48 ± 0.64 g/dL) was slightly reduced, suggesting mild impairment of liver synthetic function. Blood urea and serum creatinine values remained largely within the normal range, indicating relatively preserved renal function in most patients.

Table 4: Biochemical Profile of Study Participants (N = 110)		
Parameter	**Mean ± SD**	**Reference Range**
Total Bilirubin (mg/dL)	**4.82 ± 2.31**	0.2–1.2
Direct Bilirubin (mg/dL)	**2.46 ± 1.28**	0–0.3
AST (U/L)	**286.4 ± 118.5**	5–40
ALT (U/L)	**352.8 ± 141.7**	7–56
ALP (U/L)	**198.6 ± 69.4**	40–129
Total Protein (g/dL)	**6.54 ± 0.82**	6.0–8.3
Serum Albumin (g/dL)	**3.48 ± 0.64**	3.5–5.0
Blood Urea (mg/dL)	**29.7 ± 8.6**	15–40
Serum Creatinine (mg/dL)	**1.02 ± 0.31**	0.6–1.3

Table 5 demonstrates the frequency of abnormal biochemical findings among the study participants. Elevated ALT (85.5%) was the most common biochemical abnormality, followed closely by elevated AST (82.7%) and hyperbilirubinemia (71.8%). Approximately 50.9% of patients had elevated ALP levels, while 34.5% exhibited hypoalbuminemia, indicating varying degrees of hepatic dysfunction. Elevated serum creatinine was observed in only 11.8% of patients, suggesting that renal involvement was relatively uncommon. Overall, liver enzyme abnormalities and hyperbilirubinemia were the predominant biochemical alterations associated with viral hepatitis in this study.

Table 5: Frequency of Biochemical Abnormalities Among Viral Hepatitis Patients (N = 110)		
Biochemical Abnormality	**Frequency (n)**	**Percentage (%)**
Elevated ALT	94	85.5
Elevated AST	91	82.7
Hyperbilirubinemia	79	71.8
Elevated ALP	56	50.9
Hypoalbuminemia	38	34.5
Elevated Serum Creatinine	13	11.8

Discussion

This retrospective study was designed to analyse the biochemical profile of patients with viral hepatitis of 110 cases in a tertiary care hospital at Bihta, Patna, Bihar. The results indicated that Hepatitis B virus (HBV) was the major etiological agent followed by HCV, HEV, HAV and HDV. Furthermore, the majority of patients was young and middle-aged adults (between 21-40 years, 40.0%) and the males represented 61.8% of the study population. Positive liver enzyme changes were seen (ALT and AST), and bilirubin levels were elevated, indicating a significant hepatocellular injury in patients with viral hepatitis"[14].

The frequency of HBV (41.8%) in our study was very similar to the study by Dabadghao et al. which reported 40.5% of all cases of viral hepatitis. Similarly, Tandon et al. found that about 42% of adult cases of sporadic viral hepatitis patients in India were due to HBV, thus highlighting the significance of hepatitis B as a major cause of liver disease in adults in India. Acharya et al. and Chandra et al. also reported similar results, where HBV was found to be one of the major causes of acute viral hepatitis in adults. However, in the studied region Dabadghao et al. [15] reported HEV (45%) as the most prevalent viral Hepatitis, suggesting that the prevalence of hepatitis viruses could differ based on geographic area, sanitation, environmental conditions and local epidemiology. It was observed from the present study that 40.0% of the patients were found within the age group of 21-40 years with an average age of 39.8 years ±14.6 years. The results agree with those of Tandon et al. who stated that adults aged 21-40 years are mostly affected by HBV infections. In a similar observation Chakrabarti et al., [16] found that 33.3% of HEV cases were in the age group 21-30 years, and Modi et al. noted that HEV infection was found to be most common in the age group 21-30 years.

The higher prevalence of viral hepatitis in the economically active age group could be attributed to increased exposure to contaminated food, water, and/or infected blood products, and to an increase in social mobility among these age groups. Another important aspect of the present study was the male predominance as there were 61.8% of male patients. The present observation is consistent with the report of Dabadghao et al who observed that 70% of viral hepatitis patients were males. Similarly, Zhang et al. noted that 85.2% of patients who had sporadic hepatitis were males while Modi et al. and Chakrabarti et al. reported similar gender distributions. There might be more males because of the occupational exposure of males, more outdoor activities, behavioral risk factors and a higher rate of seeking health care among males.

The male predominance found in the present study, however, was somewhat less than that of Zhang et al. [17] which may indicate some differences in disease epidemiology in different areas of the country. The clinical features noted in the present study were mainly: Jaundice (74.5%), weakness/fatigue (70.9%), loss of appetite (59.1%), dark urine (52.7%), nausea and vomiting (49.1%) and abdominal pain (43.6%). These results are similar to that of Zhang et al, with the most common initial symptoms being jaundice (85.7%), fatigue (70.5%) and anorexia (64.8%). Likewise, Dabadghao et al. defined the main complaints of patients with viral hepatitis as fever, malaise, generalized weakness and jaundice. A decrease in appetite, fever, and gastrointestinal symptoms were also noted by Tong et al. [18] as common symptoms of hepatitis A infection. Our study revealed a somewhat less frequent presentation of jaundice, but the overall clinical picture was similar, which is consistent with the typical picture of acute viral hepatitis. The study population showed definite biochemical abnormalities in the liver. The mean ALT (352.8 ± 141.7 U/L) and AST (286.4 ± 118.5 U/L) levels were markedly elevated, while total bilirubin (4.82 ± 2.31 mg/dL) and direct bilirubin (2.46 ± 1.28 mg/dL) were substantially increased. Moreover, 85.5% of patients had elevated ALT and 82.7% had elevated AST levels, which is suggestive of diffuse hepatocellular injury. The results are in line with earlier reports documenting that acute viral hepatitis is accompanied by marked increase in the levels of aminotransferases and bilirubin, which is related to hepatocyte necrosis and inflammatory liver injury. The relatively lower prevalence of hypoalbuminemia (34.5%) and elevated serum creatinine (11.8%) indicate that most of the patients had good hepatic synthetic function and very little renal involvement, as is expected in uncomplicated viral hepatitis [19] . There are some limitations in the present study which need to be taken into consideration when interpreting the results of this study. As a retrospective single-center study, it depended

on existing hospital records that restricted the evaluation of lifestyle factors, vaccination history, nutritional status, viral load and long-term outcomes.

The findings may also have limited applicability due to the relatively small patient population (110 patients), as well as the relatively short study period. The study, however, is helpful in terms of biochemical changes that occur in patients with viral hepatitis attending a tertiary care centre in Bihar. Further prospective, multicenter studies of larger populations, viral genotype and long-term follow-up are recommended to further clarify disease course, response to treatment, and predictive biochemical markers in viral hepatitis patients.

Conclusion

The current retrospective study revealed that viral hepatitis remains an important cause of liver dysfunction in the patients visiting a tertiary care hospital. Hepatitis B was found to be the most prevalent viral hepatitis and was mainly seen in young and middle-aged adults and was more prevalent in males. The clinical picture was predominantly dominated by the presence of jaundice, fatigue, loss of appetite and other constitutional symptoms. Biochemical analysis showed significant liver dysfunction with high levels of liver enzymes and bilirubin, signifying significant hepatocellular damage, and relatively normal renal function in most patients. The present results highlight the need for periodic biochemical testing for viral hepatitis early detection, severity assessment and surveillance. Early laboratory assessment along with appropriate clinical management can help contribute to better patient outcomes and avoid the progression of liver disease towards chronic liver disease and its consequences. More large-scale, prospective studies are suggested to confirm these results and support evidence of the effectiveness of these management strategies.

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