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Original Article

Biochemical Alterations in Acute Liver Failure and Its Relation with Prognosis

MM Hossain[1], MAS Miah[2], AMS Hasan[3], BK Tarafder[4], MM Alam[5], MAB Siddique[6]

Abstract:

Acute liver failure (ALF) is a severe condition leading to fatal complications and death. Early detection and proper management can save life. The aim of the study was to analyze different biochemical values in acute liver failure and its relation with outcome. This study was conducted over 64 admitted patients in two medical college hospitals for duration of one and half year from December 2013 to May 2015. At presentation S. bilirubin level was in the range of 5-20 mg/dl in 46 (71.88%), S. ALT level in the range of 100 - 500 U/L in 46 (71.88%) and prothrombin time more than 22 seconds in 40 (62.50%) patients. Among other biochemical values S. creatinine was >1.5 mg/dl in 14 (21.88%), random blood glucose level < 2.5 mg/dl in 12 (18.75%) and hyponatremia in 20 (43.48%) patients. Majority (56.25%) of patients were HEV positive. Mortality was 100% in patients with S. bilirubin, S.ALT or prothrombin time level >10 mg/dl, >500 U/L and >21 seconds respectively at presentation. The higher the liver biochemical values the higher is the mortality rate. More multicentre study with large sample size is recommended to make a concrete comment.

Key words: Acute Liver Failure (ALF), Encephalopathy, Viral Hepatitis, ALT, Prothrombin Time.

Introduction:

Acute liver failure (ALF) is described as severe liver injury in a patient without a previous history of liver disease who develops encephalopathy within 8 weeks of the initial symptoms[1]. Acute liver failure (ALF) can cause serious complications, including excessive bleeding and increased pressure in the brain. It is a medical emergency that requires hospitalization[2].

1. Dr. Md. Motahar Hossain, MBBS, FCPS (Medicine), Associate Professor, Department of Medicine, Colonel Malek Medical College, Manikganj.

2. Dr. Md. Abdus Sattar Miah, MBBS, MD (Internal Medicine), Associate Professor, Department of Medicine, Pabna Medical College, Pabna.

3. Dr. Abu Mohammad Shafiqul Hasan, MBBS, FCPS (Medicine), Associate Professor, Department of Medicine, Pabna Medical College, Pabna.

4. Dr. Binoy Krishna Tarafder, MBBS, FCPS (Medicine), Associate Professor, Department of Medicine, Colonel Malek Medical College, Manikganj.

5. Dr. Md. Mahbubul Alam, MBBS, MD (Medicine), Assistant Professor, Department of Medicine, Pabna Medical College, Pabna.

6. Dr. Md. Abu Bakar Siddique, MBBS, MD (Medicine), Assistant Professor, Department of Medicine, Faridpur Medical College, Faridpur.

Address of correspondence :
Dr. Md. Motahar Hossain, MBBS, FCPS (Medicine), Associate Professor, Department of Medicine, Colonel Malek Medical College, Manikganj. Mobile: +88-01819991820,
E-mail: drmhosain15@gmail.com

The etiology of ALF varies widely depending on geographic location. Viral hepatitis is the most common etiology in the underdeveloped countries and acetaminophen overdose (39% of cases) and idiosyncratic drug reactions (antituberculosis drugs, antiepileptics and antibiotics) in the developed countries[3]. Other etiologies include poisonous mushrooms (*Amanita phalloides*), shock, hyperthermia or hypothermia, Budd-Chiari syndrome, malignancy (most commonly lymphomas), Wilson disease, Reye syndrome and fatty liver of pregnancy[4,5]. Diagnosis of acute liver failure is based on clinical findings such as jaundice, encephalopathy and small liver size and biochemical findings such as hyperbilirubinaemia, high serum aminotransferases level and low values of coagulation factors that is prolonged prothrombin time[6]. Acute liver failure often causes multisystem organ failure[7]. Frequently the presenting symptoms are nonspecific- including fatigue, malaise, anorexia, nausea, abdominal pain, fever, and jaundice[7,8]. Various biochemical changes occur in acute liver failure (ALF), most important is high liver biochemical values and as a part of multisystem organ failure S. creatinine, Blood urea, Blood sugar, S. electrolytes and Prothrombin time also changes[7,9,10]. Acute liver failure carries a very high mortality rate (widely reported to be in excess of 80%) [11]. However, with an improved understanding and recognition of the syndrome, more aggressive medical

therapy, intensive care monitoring and the advent of orthotopic liver transplantation (OLT) as a treatment option, survival rates have improved considerably[12]. The current study was aimed to evaluate different biochemical parameters found in the patients and its relation with prognosis.

Materials and Methods:

This clinical study was done in the Department of Medicine, Pabna Medical College Hospital (PMCH), Pabna and Faridpur Medical College Hospital (FMCH), Faridpur, Bangladesh. The duration of the study was from December 2013 to May 2015. The study comprises 64 patients with acute liver failure. There were 38 males and 26 females. Age ranges of the patients were 9 to 61 years. Patients with severe acute liver injury, presence of any degree of hepatic encephalopathy, duration of illness < 8 weeks and INR ≥ 1.3 were included in the study. Patients with pre-existing liver disease and patients who were referred to higher centre or self-discharged shortly were excluded. The selected patients presented with jaundice and hepatic encephalopathy. Severity of hepatic encephalopathy was judged according to West Haven Grading System:- Grade 1-Trivial lack of awareness, euphoria or anxiety. Grade 2-Lethargy or apathy, minimal disorientation for time or place.Grade 3-Somnolence to semi-stupor but responsive to verbal stimuli, confusion, gross disorientation and Grade 4-Coma. History and physical findings were recorded on a predesigned data form. Biochemical and haematological investigations which includes S. bilirubin, S. ALT, S. total protein, S. albumin, S. creatinine, Blood urea, Blood sugar, S. electrolytes and Prothrombin time were done and recorded. Viral markers for hepatitis - A, B, C & E were also done. The patients were treated and followed-up in the wards till they improved or expired. Improvements were assessed clinically by seeing the improvement of jaundice, increase in the size of the liver and improvement of encephalopathy and biochemically by seeing the reduction in serum bilirubin and ALT levels and improvement of prothrombin time. The mean duration of follow-up was 3±1 weeks.

Results:

A total number of 64 patients were included on the basis of the criteria for the diagnosis of acute liver failure. Among these 64 patients, 34 (53.13%) patients expired in this study. Serum bilirubin was done in all 64 patients and the result is shown in table-I. Total 54 (84.38%) patients had S. bilirubin level between 5 - 30 mg/dl, 08 (12.5%) patients had S. bilirubin level below 5mg/dl and 02 (03.12%) patients had S. bilirubin level above 30 mg/dl.

Table-I: Serum bilirubin levels at presentation *(n=64)*

S. bilirubin (mg/dl)	Number of patients (%)	Mortality (%)
<5	08 (12.5)	00 (0)
5-10	20 (31.25)	02 (10)
10.1-20	26 (40.63)	22 (84.62)
20.1-30	08 (12.5)	08 (100)
>30	02 (3.12)	02 (100)

Serum ALT level was also measured in all patients. Table-II shows that S. ALT level was found between 101 - 1000 U/L in 50 (78.13%) patients.

Table -II: Serum ALT levels at presentation *(n=64)*

S. ALT(U/L)	Number of patients (%)	Mortality (%)
<100	12 (18.75)	00 (0)
101-300	36 (56.25)	21 (58.34)
301—500	10 (15.63)	07 (70)
501-1000	04 (6.25)	04 (100)
>1000	02 (3.12)	02 (100)

Serum albumin level was found below 3 gm/dl in 32(50%) patients. Blood glucose level was measured in all patients and hypoglyceamia was found in 12 (18.75%) patients and all died. S. creatinine and blood urea level were also measured in all patients and 14 (21.88%) patients had S. creatinine level above 1.5mg/dl and blood urea level above 60mg/dl. Serum electrolytes level was done in 46 (71.88%) patients, among them 20 (43.48%) patients had hyponatraemia and only 06 (13%) patients had hypokalaemia. Prothrombin time was done in all cases; 40 (62.5%) patient's prothrombin time was found more than 22 seconds (Table-III).

Table - III: Prothrombin time at presentation *(n=64)*

Prothrombin time(seconds)	Number of patients (%)	Mortality (%)
15-17	18 (28.13)	00 (0)
18-21	06 (9.38)	00 (0)
22-30	22 (34.38)	22 (100)
>30	18 (28.13)	18 (100)

Viral markers for Hepatitis- A, B, C and E viruses were done in all patients (Table -IV). Marker for Hepatitis-E was found positive in 36 (56.25%) patients, marker for Hepatitis-B was found positive in 20 (31.25%) patients, marker for Hepatitis-C & A was found negative in all cases, both Hepatitis-B & E markers were found positive in 04 (06.25%) patients and no viral markers were found positive in o4 (06.25%) patients.

Table - IV: Viral markers *(n=64)*

Viral Markers	Number of patients (%)
HEV	36 (56.25)
HBV	20 (31.25)
HEV + HBV	04 (6.25)
No marker detected	04 (6.25)

Discussion:

Acute liver failure (ALF) is a dramatic, unpredictable and often devastating clinical condition. This study comprised the survey of different biochemical alterations found in acute liver failure and its relation to prognosis in two medical institutes in Bangladesh.

In this study, S. bilirubin level was found more than 10mg/dl in 36 (56.25%) patients and 32 (88.88%) of them died. This is in close relation to other studies[7,13]. S. ALT level was found more than 100 U/L in 52 (81.25%) patients and 06 (09.37%) patients had S. ALT level more than 500 U/L. All these 06 patients died and no patients those had S. ALT level less than 100 U/L died. This was also found in other studies[7,13]. Hypoglyceamia was found in 12 (18.75%) patients and all died (100%), this is higher in relation to other studies[14]. It might be due to lack of logistic support to manage hypoglyceamia. Functional renal failure developed in about 55% of acute liver failure (ALF), but in this study only 21.88% (n=14) patients were found who had S. creatinine and Blood urea level above normal value[14-16]. Age may be a factor for this, as majority of patients 34 (53.13%) were below 35 years in this study. Hyponatraemia and hypokalaemia were found in 20 (43.48%) and 06 (13%) patients respectively, most of them died, this is also lower than other studies[16,17]. Lack of investigation facility is the reason for this, as this test can't be done in all patients. All patients who died had prothrombin time more than 22 seconds, this is in close relation to standard prognostic criteria of ALF[9,16,17].

No viral markers were detected in 04 (06.25%) patients and 02(50%) of them died. Four (06.25%) patients had both HBV and HEV positive and all died (100%). HBV was found in 20 (31.25%) patients and 11(55%) died. HEV was found in 36 (56.25%) patients, out of these 19 (52.78%) patients died. This finding is closely related to some studies in developing countries including India[18,19].

Conclusion:

In conclusion, the higher the liver biochemical values the higher is the mortality rate. Abnormal S. creatinine, Blood sugar and S. electrolytes levels are related to very high mortality. Different hepatitis virus as a causative agent did not carry any significant difference in perspective of prognosis. It also should keep in our mind that acute liver failure can occur with mild elevation of S. bilirubin and S. ALT level. Further multicentre study with large sample size is recommended.

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