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Original Research Article

ASSESSMENT OF MORTALITY IN LIVER CIRRHOSIS AND ACUTE KIDNEY INJURY CASES

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Abstract: *The current analysis was designed to assess the short-term mortality in liver cirrhosis patients with acute kidney disease and assess the predictive factors of such mortality. A prospective study was conducted in the Department of Medicine & Gastroenterology of Bakhtawar Amin Hospital Multan from January 2022- January 2023. A total of 100 decompensated cirrhotic patients with acute kidney injury were included in the study. Baseline serum creatinine levels were measured at admission and every day after admission in all patients. Prothrombin time, ascitic fluid examination, and basic liver and kidney function tests were performed on every patient after admission. The patients' complications, death during the hospital stay, and 30-day mortality were noted for all admitted patients. Among 100 patients, 90 (90%) were male, and the mean age was 47. The cause of liver failure in 51% of patients was the Hepatitis B virus, and 93% of patients presented with ascites. The type of acute kidney injury and its stage, CTP and MELD score, HE, serum bilirubin and creatinine, PT, jaundice, and SGOT were mortality predictors. The MELD score showed an accuracy of 77.5%, and the CTP score had a 73.44% accuracy in predicting short-term mortality. Based on the results, the type of acute kidney injury and its stage, CTP and MELD score, HE, serum bilirubin and creatinine, PT, jaundice, and SGOT are mortality predictors in cirrhotic patients with acute kidney injury.*

Keywords: Liver Cirrhosis, Acute Kidney Injury, Short-Term Mortality, Ascites

Introduction

Advances in neonatal care are improving survival Among other deadly complications of liver cirrhosis, renal failure is the most common one and leads to poor disease development (Appenrodt and Lammert, 2018; Cullaro et al., 2019b). Almost 20% of admitted cirrhosis patients are diagnosed with acute kidney injury (Bai et al., 2019). The development of acute kidney injury in these patients is spontaneous, but an acute event like bacterial infection usually causes it. The development of infection in renal failure patients reduces the odds of survival by 31%, corresponding to hepatorenal syndrome (Wong et al., 2019). It is significant to assess renal failure in cirrhotic patients to improve treatment.

Serum creatinine levels are the most important biomarker of acute kidney disease in patients with cirrhosis but factors like sex, age, ethnicity, and weight limit it. A reduction also influences creatinine production secondary to muscular atrophy and elevated proximal tubular secretion, bilirubin, and volume of distribution. In a study on cirrhotic patients, the mean difference between the measured and estimated glomerular filtration rate was 17 ± 32 mL/min (Cullaro et al., 2019a). In another study on liver failure patients, the mean glomerular filtration rate was 98 mL/min/1.73 m2. (Mantovani et al., 2018) These results may be misleading due to errors in collecting and measuring samples and oliguria in cirrhosis patients with ascites. The present study was conducted to assess short-term mortality in liver cirrhosis patients with acute kidney disease and assess the predictive factors of such mortality.

Methodology

A prospective study was conducted in the Department of Medicine & Gastroenterology of Bakhtawar Amin Hospital Multan from January 2022- January 2023. A total of 100 decompensated cirrhotic patients with acute kidney injury were included in the study. All the patients provided their consent to be included in the study. Patients younger than 18 years with advanced cardiopulmonary disease, disseminated malignancy, pregnancy, immunocompromised patients, chronic renal disease, organ transplant, obstructive uropathy, hepatic malignancy, and cirrhosis do not require admission were not included in the study. The ethical board approved the study of the hospital.

Baseline serum creatinine levels were measured at admission and every day after admission in all patients. Prothrombin time, ascitic fluid examination,

and basic liver and kidney function tests were performed on every patient after admission. The patients' complications, death during the hospital stay, and 30-day mortality were noted for all admitted patients. A 30-day follow was done in all patients from admission to death or discharge. Patients were administered standard treatment for hepatitis B & C, hepatic encephalopathy, alcoholic liver disease, HRS, SBP, upper gastrointestinal bleeding, etc.

All the data was evaluated and analyzed by SPSS version 23. The proportion was used to present categorical data, and the mean was calculated to present continuous data. T-test was performed to compare the means of survivors and the dead. A p-value of 0.10 was taken as significant.

Results

Among 100 patients, 90 (90%) were male, and the mean age was 47. The cause of liver failure in 51% of patients was the Hepatitis B virus, and 93% of patients presented with ascites. 32 (32%) patients had an infection as a cause of kidney injury. The mean hemoglobin was 8.25 (7.88-9.22), and the WBC count was 12,050 (10,487-13,567). The baseline and hematological characteristics of patients are shown in Table I and II. Table III & IV shows that type of acute kidney injury and its stage, CTP and MELD score, HE, serum bilirubin and creatinine, PT, jaundice, and SGOT were mortality predictors. The MELD score showed an accuracy of 77.5%, and the CTP score had a 73.44% accuracy in predicting short-term mortality (Table V).

Table I: Demographic characteristics of the study population

Features	N= 100
Mean age (years)	47
Gender (male: female)	90:10
Etiology of liver failure	
HBV	51 (51%)
Cryptogenic	25 (25%)
HCV	10 (10%)
NASH	7 (7%)
Wilson	7 (7%)
Clinical presentation	
Ascites	93 (93%)
Jaundice	72 (72%)
Decreased urine output	25% (25%)
Upper GI bleeding	20 (20%)
Hepatic encephalopathy	20 (20%)
Abdominal pain	16 (16%)
Type of acute kidney injury	
Infection	32 (32%)
Hypovolemia	30 (30%)
HRS	14 (14%)
Parenchymal	7 (7%)
Mixed	10 (10%)

Table II: Hematological and biochemical features of patients

Variables	95% CI
Hemoglobin	8.25 (7.88-9.22)
Total WBC count	12,050 (10,487-13,567)
Platelets count	1.08 (1.01-1.15)
Serum bilirubin	4.87 (3.05-7.01)
SGPT	90 (68-112)
SGOT	142 (118-167)
INR	1.68 (1.55-1.80)
Serum albumin	2.47 (2.38-2.56)
Baseline serum creatinine	1.00 (0.96-1.05)
Baseline blood urea	20 (18-22)
Serum creatinine at enrollment	2.66 (2.43-2.89)
Sodium	127 (125-128)

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Potassium	4.13 (4.03-4.29)
SAAG	1.73 (1.65-1.81)
CTP	9 (8.78-9.4)
MELD	26 (24-27)

Table III: Comparison of parameters between survivors and non-survivors

Variables	Non-survivors	Survivors	P value
Age (years)	45.13 (42.24-48.11)	48.7 (45.3-51.77)	0.1032
MAP	84 (81-87)	81 (78-84)	0.1310
Pulse	90 (88-93)	91 (88-93)	0.80
Hemoglobin	8.51 (8.08-9.21)	8.10 (7.60-8.85)	0.2508
Total white blood cells	13,963 (11,498-16,573)	12,058 (10,250-14,098)	0.2398
Platelets	0.97 (0.79-1.10)	1.10 (1.0-1.27)	0.1110
Serum bilirubin	7.14 (4.26-9.88)	3.19 (2.50-4.55)	0.0001
SGPT	109 (70-147)	73 (49-97)	0.1040
SGOT	178 (135-224)	109 (85-132)	0.0040
PT	1.87 (1.69-2.07)	1.32 (1.22-1.44)	0.0001
Albumin	2.38 (2.28-2.47)	2.41 (2.28-2.55)	0.3110
Baseline urea	22.46 (18.57-24.19)	21.75 (18.75-24.77)	0.7776
Baseline creatinine	0.97 (0.93-1.0)	1.036 (0.96-1.06)	0.3312
Urea at admission	81.66 (69.55-93.74)	76.49 (64.21-88.47)	0.0545
Creatinine at admission	2.95 (2.55-3.33)	2.22 (2.02-2.64)	0.0045
Minimum Cr	1.22 (1.11-1.53)	1.08 (1.00-1.24)	0.0001
Maximum Cr	3.2 (2.8-3.74)	2.27 (2.10-2.50)	0.0001
Sodium	125 (123-127)	126 (124-128)	0.7312
Potassium	3.08 (2.87-3.25)	3.12 (2.99-3.39)	0.5812
CTP score	10.11 (9.4-10.5)	8.22 (7.87-8.60)	0.0001
MELD score	32 (30-34)	22 (21-24)	0.0001

Table IV: Predictors of 30-day mortality in bi and multivariate analysis

Parameters	Bivariate analysis		Multivariate analysis	
	Chi-square value	P value	Adjusted hazard ratio	P value
Jaundice	10.98	0.0008	3.50 (1.70-7.24)	0.001
Ascites	0.62	0.4243		
Hepatic encephalopathy	15.10	0.0001	2.15 (1.23-3.74)	0.006
Upper GI bleeding	2.63	0.1034		
Abdominal pain	1.74	0.1846		
SBP	0	0.9598		
AKI type	30.14	0.0001		
Dialysis	0.03	0.8144		
AKI stage at admission	4.72	0.0914		
AKI stage at the peak	12.27	0.0018	1.89 (1.22-2.90)	0.001
Creatinine >1.5	3.87	0.0474	3.35 (0.88-14.12)	0.082

Table V: Prognostic scores for predicting 30-day mortality

Cut off value	AUC	Sensitivity	Specificity	Accuracy
CTP score	0.79 (0.743-0.86)	65.54	80.41	73.44
MELD score	0.80 (0.75-0.88)	74.33	81	77.5

Discussion

We included 100 decompensated cirrhotic patients with acute kidney injury. The 30-day mortality and its predictors were studied. The most common cause of liver failure was the hepatitis B virus (51%). These results contradict Kumar et al. and other studies that found alcohol to be the etiology of 52% of patients

(Gustot and Jalan, 2019; Kumar et al., 2017; Singal and Mathurin, 2021). This difference is due to the few alcohol drinkers in Pakistan (Talat et al., 2020).

93% of the population was diagnosed with ascites, similar to Fagundes et al. (Fagundes et al., 2013). 72% of the patients had jaundice, a predictor of mortality. The non-survivors had a mean bilirubin of 7.14 (4.26-9.88) compared to the survivors' 3.19 (2.50-4.55). These levels are comparable to the results of Fagundes et al., which reported a 9 ± 10 mg/dL serum bilirubin in non-survivors and a 3 ± 4 mg/dL level in survivors. 20% had hepatic encephalopathy, which was also among the predictors of mortality, with an adjusted hazard ratio of 2.15 (1.23-3.74). Vaz et al. concluded UGIB as the leading of decompensation (Vaz et al., 2020), and Wong et al. (Wong et al., 2022) reported gastrointestinal bleeding as the commonest cause of decompensation, as shown in our study.

The survivors and non-survivors significantly differed in serum creatinine levels at admission, min Cr, max Cr, CTP and MELD score, INR, bilirubin, and SGOT. Similarly, Piano et al. (Piano et al., 2013) also reported a significant difference between survivors and non-survivors regarding creatinine level at admission and peak level, CTP and MELD score, bilirubin, albumin, and INR. D'Amico et al. (D'Amico et al., 2006) also reported the same predictors of mortality in cirrhotic patients in their study. Serum creatinine > 1.5 mg/dL at admission seemed to increase the mortality rate as per the definition of acute kidney injury by the International Club of Ascites. Serum creatinine may lead to the reversal of AKI, but if it rises constantly, it can cause increased mortality. Wong et al. (Wong et al., 2013), the short-term mortality rate was high in unrecovered patients (80%), and patients with partial and complete recovery (40%) can comparatively lower mortality rates.

Our study had limitations, including a short study period and a limited study population. A multi-center, retrospective study may reveal better-detailed results.

Conclusion

Type of acute kidney injury and its stage, CTP and MELD score, HE, serum bilirubin and creatinine, PT, jaundice, and SGOT are mortality predictors in cirrhotic patients with acute kidney injury.

Conflict of interest

The authors declared absence of conflict of interest.

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