Original Article

Comparison of CTP Score, MELD Na, and CLIF SOFA Score in Predicting Three Months Mortality in Cirrhotic Patients in a Tertiary Care Center

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Keywords: *Cirrhosis; CTP score; CLIF SOFA score; MELD Na*

Abstract

Background: Cirrhosis of liver is a major health problem in our country. With the development of decompensation there is an increased probability of mortality. CTP score, MELD Na, and CLIF SOFA score are used in predicting three months mortality in cirrhotic patients. We aim in evaluating the score which has the best results in our settings.

Methods: 120 cirrhotic patients were admitted in the Department of Gastroenterology within one year for complications of cirrhosis. CTP score, MELD Na, and CLIF SOFA score were calculated. The performance of CTP score, MELD Na and CLIF SOFA score in predicting three-month mortality was analyzed by calculating the area under the receiver operating characteristics curves.

Results: Among the 120 patients, there were 81 males and 39 females with age range of 18 to 76 years. Abdominal distension and jaundice combined was the most common presentation 41 (34.2%). Alcohol induced cirrhosis of liver comprised the majority of cases 90 (75%), followed by Hepatitis B virus induced cirrhosis 14 (11.7%). Acute-on-chronic liver failure was present in 39 (32.5%) patients. On 3 months follow up 56 (46.7%) patients had died. The area under the receiver operating characteristics for CTP score, MELD Na and CLIF SOFA score was 0.86, 0.88 and 0.91 respectively.

Conclusions: Cirrhosis of liver is one of the common presentations in our clinics with alcoholic cirrhosis being the most common in Nepal. Ascites, hepatic encephalopathy, impaired renal function and ACLF are independent predictors of mortality. CLIF SOFA score was more sensitive in predicting three months mortality as compared to CTP and MELD Na scores in our settings.

Introduction

Liver cirrhosis is defined histologically as a bridging fibrosis leading to deranged liver architecture and regenerative nodules and is considered the end stage of a variety of chronic liver diseases, and is irreversible in its advanced stages.[1] Cirrhosis is currently the 11th most common cause of death globally and liver cancer is the 16th leading cause of death; combined, they account for 3.5% of all deaths worldwide.[2] There is a rise in cirrhosis due to increase in abuse of alcohol, surge in hepatitis B and hepatitis C infection and metabolic dysfunction-associated steatotic liver disease (MAFLD). Decompensation of cirrhosis is defined by the occurrence of variceal hemorrhage, ascites, encephalopathy or jaundice.[3] The median survival in patients with compensated and decompensated cirrhosis is 9 to 12 and 2 years respectively.[4] Generic scores to determine mortality risk in decompensated cirrhosis include the Child-Turcotte-Pugh score (CTP score), Model for End-Stage Liver Disease (MELD), MELD Na, Model for End-stage Liver Disease to sodium ratio (MESO) and the Chronic Liver Failure Sequential Organ Failure Assessment (CLIF SOFA) score.

In a study by Hassan et al in Egypt 1000 cirrhotic patients were enrolled in a retrospective study; traditional and new prognostic models such as CTP score, MELD, MELD Na and MESO were calculated and compared.[5] They found that all prognostic models were good predictors of 1-year mortality in patients with decompensated cirrhosis; however, MELD-Na was the best for outcome prediction.

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However, no such study has been done in our country regarding this prognostic models. Thus, the aim of this study was to compare different prognostic models i.e. CTP, MELD Na and CLIF SOFA in cirrhosis of liver, to find out which model was the best predictor of prognosis in our settings.

Methods

This was a prospective observational cross-sectional study. The study was approved by the Institutional Review Committee (IRC) of Institute of Medicine (IOM), Maharajgunj and consent was taken from all participants. Patients who didn't give informed consent were not enrolled in the study. Based on inclusion and exclusion criteria 120 patients with cirrhosis of liver, attending the Department of Gastroenterology, Tribhuvan University Teaching Hospital (TUTH) were enrolled in the study. The study was done for one year with a follow up done after 3 months from the day of enrollment for each patient. The diagnosis of cirrhosis was established by presence of portal hypertension (ascites, gastro-esophageal varices, hepatic encephalopathy) and liver imaging studies. Clinical evaluation included history taking, physical examination and baseline investigations done accordingly. CTP score, MELD Na, and CLIF SOFA score were calculated. The CTP score is based on five variables: grade of ascites, grade of encephalopathy, total bilirubin, international normalized ratio, and albumin. Descriptive data with normal distribution are reported as mean ± standard deviation or as percentage. P-value was calculated. The performance of the CTP score, MELD Na and CLIF-SOFA score in predicting 3-month mortality was analyzed by calculating the area under the receiver operating characteristics (AUROC) curves. Statistical analyses were carried out by the SPSS software, version 18.0 (SPSS, Chicago, IL, USA).

Results

A total of 120 patients with cirrhosis of liver were evaluated. There were 81 (67.5%) males and 39 (32.5%) females with age range of 18 to 76 years with mean age of 47.55 years. Of the study population only 44 (36.7 %) were literate. Farming consisted of the major occupation 65 (54.2%), followed by self-owned business 35(29.2%). The predominant chief complaints comprised of abdominal distension and jaundice combined 41 (34.2%), isolated abdominal distension 5(20.8%), and hematemesis 18 (15%). Most of the patients 104 (86.7%) gave history of alcohol consumption for more than 10 years duration with majority consuming locally brewed alcohol 90 (75%). Only 16 (13.3%) patients did not consume alcohol. Of the 104 patients 76 (63.3%) were active alcohol consumers. Concomitant smoking was present in 29 (24.2%) patients. History of IV drug abuse was given by 3 (2.5%) patients. Alcohol induced cirrhosis of liver comprised the majority of cases 90 patients (75%), followed by Hepatitis B induced cirrhosis in 14 patients (11.7%).

Mean hemoglobin (Hb) was 9.7±2.3 g/dl, hematocrit 29.25±6.44%, platelets 127842±87788 /microliters, urea-7.5±6 mg/dl, creatinine 128±74 mcmol/L, sodium (Na) 132 ±4.2 mmol/L. Mean bilirubin was 127±146 micromol/L, AST 83± 67 U/L, albumin 28±6.9 g/dl, prothrombin time (PT) was 22.7 ±7.6 and INR 1.8±0.6. Impaired renal function was seen in 22 (18.3%) patients and was associated with high probability of 3 months mortality (P value < 0.007).

Ascites was present in 93 (77.5%) patients and is an independent predictor of mortality (P value < 0.004). Spontaneous bacterial peritonitis was present in 23 (19.2%) patients. Hepatic encephalopathy was seen in 68 (56.7%) patients and was associated with high probability of 3 months mortality (P value < 0.0001). Hematemesis was seen in 31 (25.8%) patients but was not associated with high chance of 3 months mortality (P value -0.398).

The mean CTP score was 10.02 ±2.65 with CTP A 15 (12.5%) patients, CTP B 35 (29.2%) patients and CTP C 70 (58.3%) patients. Mean MELD score was 21.14±8.3 and mean MELD Na score was 22.79 ± 8.9. The mean CLIF SOFA score was 7.43±3.08. Acute-on-chronic liver failure (ACLF) was present in 39 (32.5%) patients. Patients with ACLF were found to have higher 3 months mortality 35 (62.5%) P value < 0.001. On follow up after three months 56 (46.7%) patients had expired. Various variables are compared with mortality or non-mortality within 3 months which are depicted in Table 1.

Table 1: Comparison of various variables with mortality or non-mortality within three months (N=120)

Variables	Overall (N/%)	Mortality within 3 months (N=56) (N/%)	Non-mortality within 3 months (N=64) (N/%)	P value
Ascites	93 (77.5)	50 (89.2)	43 (67.1)	0.004
Spontaneous bacterial peritonitis (SBP)	23 (19.2)	14(25)	9(14)	0.427
Hematemesis	30(25)	12(21.4)	18(28.1)	0.398
Hepatic encephalopathy (HE)	68 (56.7)	46(82.1)	22(34.3)	< 0.0001
Impaired renal function	22 (18.3)	16(28.5)	6(9.3)	0.007
ACLF	39 (32.5)	35(62.5)	4(6.2)	< 0.0001
CTP score	10 (8-12)	12(11-13)	8.5(7-10)	< 0.0001
CTP classification A/B/C	15/35/70(12.5/29.2/58.3)	0/8/48(0/14.2/85.7	15/27/22(23.4/ 42.1/ 34.37)	< 0.0001
MELD	19(14-27)	27 (22-33)	15(11-19)	< 0.0001
MELD Na	22 (16-30)	31 (24-35	17 (11-22)	< 0.0001
CLIF SOFA score	7.5 (5-10)	10 (8-11)	5 (4-7)	< 0.0001

It was found that ascites, SBP, hematemesis and impaired renal function have less predictive value for three months mortality whereas HE, ACLF, CTP score, MELD, MELD Na and CLIF SOFA score have a significant predictive value for three months mortality as depicted by significant P value in Table 1.

When we compare CTP score, MELD, MELD Na and CLIF SOFA score, we found that MELD Na has slightly higher specificity whereas CLIF SOFA score was the most sensitive in predicting three months mortality which is shown in Table 2.

Table 2: Performance characteristics of various scoring systems in predicting 3 months mortality

Scores	AUROC (95% CI)	Cutoff	Sensitivity	Specificity	P value
CTP score	0.86 (0.78-0.91)	>10	82.14	79.69	<0.0001
MELD	0.88 (0.81-0.93)	>20	82.14	85.94	<0.0001
MELD Na	0.88 (0.80-0.93)	>22	80.36	81.25	<0.0001
CLIF SOFA score	0.91 (0.84-0.95)	>7	85.71	81.25	<0.0001

The area under receiver operating characteristics (AUROC) curve for CTP score was 0.86, for MELD Na was 0.88 and CLIF SOFA was 0.91 (Table 2) with a significant P value for every scoring system but AUROC was highest for CLIF SOFA score. The ROC curve showing CTP score, MELD Na and CLIF SOFA score is shown in Figure 1.

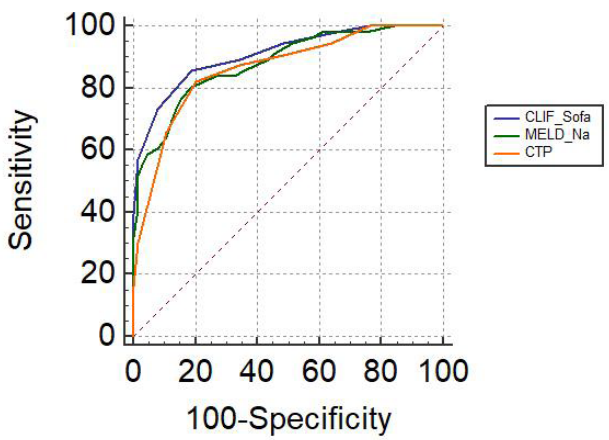

Figure 1: Receiver operating characteristics (ROC) curve comparison between scoring systems CTP score, MELD Na and CLIF SOFA score in predicting 3-month mortality

Discussion

Several predictive scoring systems have been developed and validated for predicting prognosis in cirrhotic patients. With the increasing use of sophisticated (but more expensive) technology and medical care: e.g. terlipressin in hepatorenal syndrome and gastrointestinal bleeding, transjugular intrahepatic portosystemic shunt placement in uncontrolled gastrointestinal bleeding, molecular adsorbent re-circulating system and bio-artificial livers in liver failure and liver transplantation can offer increased long-term survival. These new therapeutic possibilities require reliable prognostic factors to construct useful therapeutic algorithms for cirrhotic patients.[6] The CTP, MELD and MELD Na are proven scoring systems to predict mortality and need for liver transplantation. The CLIF-SOFA score is a newly proposed scoring system for cirrhotic patients with acute decompensation.[7] However, the value of these scores in predicting outcome for patients with cirrhosis in Nepal remains unclear. We assessed the prognostic utility of CTP score, MELD Na and CLIF-SOFA score for predicting short term i.e. 3 months mortality in cirrhotic patients in Nepal as most of the patients present with acute decompensation in our center.

According to our results, majority of our patients were male (67.5%). It is similar to a study conducted by Amundsen et al. in regional hospital in Nepal, alcohol related diseases often presented with clinical signs of liver cirrhosis and majority of the patients were of male gender (75%).[8] A predilection towards male gender could be related to the drinking habits, drinking patterns or social acceptance of drinking in Nepal in male population. In our study, alcohol was the major etiological cause of cirrhosis 75%, followed by hepatitis B induced cirrhosis 11.7%. Maskey et al. reported alcohol related cirrhosis 86% followed by cryptogenic cirrhosis 11%, hepatitis B 2% and hepatitis C 1%.[9] In Nepal, due to increase in abuse of alcohol, it has been found to be the commonest cause of cirrhosis. In our study the most common presenting symptoms were abdominal distension and jaundice combined (34.2%), isolated abdominal distension (20.8%), and hematemesis (15%). In a study in Nepal by Maskey et al. commonest presenting symptoms were abdomen distension (84.4%) and jaundice (93.3%).[9] In our study, ascites was seen in 93 (77.5%) patients which is the most common presentation in decompensated cirrhosis. In a study by Hassan et al.[5] in Egypt- ascites was reported to be present in 74.3% of the patients. Similarly, Maskey et al. reported ascites in 84.4% in adult cirrhotic patients.[9]

Spontaneous bacterial peritonitis (SBP) was present in 23 (19.2%) patients in our study which was similar to the study done by Syed et al. who reported SBP in 24.6% patients.[10] Decompensated cirrhosis have a predisposition to develop SBP due to bacterial translocation from the gut. Hematemesis was the presentation in 30 (25%). Hassan et al. reported variceal bleeding in 21.5% of patients.[5] With an increase in portal hypertension there is a higher probability of portal hypertensive gastrointestinal bleeding. Hepatic encephalopathy was present in 68 (56.7%) patients. Impaired renal function was seen in 18.3% of our study population. Acute kidney injury is considered one of the markers for severity of disease and is an independent predictor of survival. In our study, ACLF was present in 39 (32.5%) patients. Moreover, patients with ACLF were found to have high 3 months mortality 62.5%. Moreau et al. reported ACLF in 30.9% of patients.[11] They reported ACLF grade 1 in 15.8%, ACLF grade 2 in 10.9% and ACLF grade 3 in 4.4% of the patients respectively. They reported 3 months mortality rate of 51.2%. ACLF is associated with high mortality.

In our study the mean CTP score was 10.02 ±2.65 with CTP A in 15 (12.5%), CTP B in 35 (29.2%) and CTP C in 70 (58.3%), mean MELD and MELD Na score were 21.14±8.3 and 22.79 ± 8.9 respectively. The mean CLIF SOFA score was 7.43±3.08. In Nepal, due to lack of health awareness, inadequate health services and costly medical expenditures patients usually present late in hospital resulting in diagnoses of disease in late stage.

In our study, when predicting 3 months mortality the AUROC for CTP score was 0.86, for MELD Na was 0.88 and CLIF SOFA was 0.91 with P value <0.001. Zhou et al. when predicting 3 months mortality reported the AUROC for MELD Na as 0.71 and CLIF SOFA as 0.74.[12] Dhiman et al. reported AUROC for 28 days mortality for CTP, MELD and CLIF SOFA were 0.73, 0.71 and 0.79 respectively.[13]

Our study revealed that CLIF SOFA score showed more statistical significance in predicting 3 -mortality as compared to CTP score and MELD in cirrhotic patients. However, each score had a significant P value. Since CLIF SOFA score includes extrahepatic organ failure indices it has better predictive value for mortality as compared to other scores. But all the three scoring systems have their own advantage. CTP scoring is an easy score that can be calculated at the bedside. MELD Na score is currently being used for prioritizing liver transplantation in patients and CLIF SOFA score is a very useful score that can be used in the intensive care setup for prognosticating critically ill cirrhotic patients. Thus, each score has its own advantage and disadvantage. In clinical settings, appropriate score should be calculated in appropriate settings which would be beneficial for both patients and clinician.

Conclusion

Cirrhosis of liver is one of the common presentations in hospitals. Alcohol is the most common causes of end-stage liver disease in Nepal. Ascites, hepatic encephalopathy, impaired renal function and ACLF are independent predictors of mortality in patients with decompensated cirrhosis. CLIF SOFA score was more sensitive in predicting three months mortality as compared to CTP and MELD Na scores in our settings. Future prospective and larger studies are needed to confirm and support our findings.

Conflict of interest

None

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