Original Article

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Comparison of Child-Turcotte-Pugh Score and Renal Dysfunction in Predicting In-hospital Mortality In-patients with Decompensated Cirrhosis: An Observational Study

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Abstract

Background: Child-Turcotte-Pugh score (CTP score) has rarely been used to predict in-hospital mortality in cirrhosis. Furthermore, renal dysfunction is a common complication in patients with decompensated cirrhosis accelerating the mortality rate. Since renal indices are not included in the CTP score, this study was conducted to study the in-hospital mortality prediction power of CTP score and renal indices in decompensated cirrhosis.

Aim: The aim was to study the predictive power of CTP score and renal dysfunction for in-hospital mortality in patients with decompensated cirrhosis.

Methodology: It is an observational study involving 50 patients with decompensated cirrhosis admitted to our hospital during the period of October 2013 to August 2014 who are fitting into the inclusion criteria.

Results: Of 50 decompensated cirrhosis patients, 20 (40%) died within the hospital due to cirrhosis related complications. The average age was 44.7 ± 12.040 years in survivor group and 54.1 ± 9.910 years in the non-survivor group. There was male preponderance in both the study groups. For analysis, the study population was divided into survivor group and non-survivor group. Incidence of Hepatic encephalopathy and Hepatorenal syndrome was significantly higher ($P = 0.038$) in the non-survivor group (70% and 30% resp.) compared to survivor group (40% and 23.3% resp.). Mean serum creatinine value was higher in the non-survivor group (3.18 mg/dl) compared to survivor group (1.1 mg/dl) but was statistically not significant ($P = 0.128$). CTP score was slightly higher in survivor group (10.33 vs. 10.30) and there was no statistically significant difference between two groups. 18 (90%) patients in the death group belonged to child Class C compared to 20 (66.67%) patients in the discharge group. Overall, 38 (76%) patients in the study population belonged to child Class C.

Conclusion: CTP score and serum creatinine levels were found to be poor predictors of in-hospital mortality in decompensated cirrhosis. However, presence Hepatorenal syndrome was associated with increased mortality.

Key words: Cirrhosis, Creatinine, Child-Turcotte-Pugh score, In-hospital mortality

INTRODUCTION

Decompensated cirrhosis is one of the major serious illnesses requiring admission to intensive care units. Myriad of scoring systems have been designed and are being used to predict mortality in patients with cirrhosis. However, most of these scoring systems are used for predicting short-term (3 month) and long-term mortality. Very few are used to predict in-hospital mortality. Child-Turcotte-Pugh score (CTP score) has rarely been used to predict in-hospital mortality in cirrhosis. Furthermore, renal dysfunction is a common complication in patients with decompensated cirrhosis accelerating the mortality rate. Since renal indices are not considered in the CTP score, this study was conducted to assess the in-hospital

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mortality prediction power of CTP score and renal indices in decompensated cirrhosis. Serum albumin (g/dl), serum bilirubin (mg/dL), ascites, encephalopathy, nutritional status were used by Child and Turcotte in 1964 to assess the prognosis in chronic liver disease and the score was known as Child-Turcotte (CT) score.[1] In 1973, Pugh modified the score by replacing nutritional status with prothrombin time and this modified score is known as Child-Turcotte-Pugh score.[2] CTP score is classified as: A (5-6), B (7-9), C (10-15). A score of 1-3 is allotted for each of the five parameters; the higher the score (5-15), the greater the severity of CLD.[2] The limitations of CTP score are: (i) assessment of ascites and encephalopathy is subjective; (ii) prothrombin time measurement depends on the sensitivity of the thromboplastin reagent used;[3] (iii) any level of serum bilirubin more than 3 or any level of prothrombin time more than 6 will not affect CTP score;[4] (iv) CTP score has a narrow range of 7-15 (Child B or C) in patients waiting for liver transplantation, and some patients may have identical CTP score which requires the use of the time on the waiting list as a tie breaker.[5]

It is common to see a substantial degree of variability in renal function in patients with end-stage liver disease especially in those undergoing large-volume paracentesis and receiving diuretics. More importantly, diminished renal function is an important predictor of survival in those patients.[6-9]

The value of serum creatinine depends on the laboratory methods. To measure serum creatinine level, O'Leary modified Jaffe, compensated kinetic Jaffe, enzymatic and standard kinetic Jaffe methods have been used and compared in the calculation of the MELD score. There is a poor agreement among different creatinine assays, especially as serum bilirubin rises.[10] Accordingly, the new standard is an enzymatic method for measuring serum creatinine.

And, accuracy of non-invasive measurement of renal function, including serum creatinine, has been shown to be suboptimal among cirrhotic patients.[11-13]

METHODOLOGY

Source of Data

The study was conducted on 50 patients with decompensated cirrhosis of liver admitted to KIMS Hospital, Bangalore during the study period from October 2013 to August 2014.

Type of study: An observational study

Method of Collection of Data

Informed consent was obtained from all patients/ caretakers of the patients enrolled for the study. All the patients with end stage liver disease were screened for exclusion criteria and those who met the inclusion criteria were enrolled for the study. The patients' demographics, presenting complaints, past medical history, and detailed examination findings were recorded soon after admission.

The patients are selected based on clinical examinations, biochemical tests, and ultrasound abdomen. The severity of cirrhosis of the liver was assessed based on Child-Turcotte-Pugh score and patients were grouped into Class A, B, and C according to the total score of 5-6, 7-9, and 10-15. Renal dysfunction was assessed by considering elevated serum creatinine at admission and screening all patients for hepatorenal syndrome using recommended diagnostic criteria. The patients are followed until discharge or death in the hospital and were observed for any cirrhosis related complications.

Inclusion criteria were patients more than 18 years of age with cirrhosis of the liver (diagnosed by clinical,

Table 1: Comparison of serum creatinine among the study groups

Outcome	*N*	Mean	SD	Median	Minimum	Maximum	*P* value
Serum creatinine							
Discharged	30	1.10	0.833	0.70	0.30	4.20	0.002
Death	20	3.18	3.387	1.65	0.30	11.60	
Total	50	1.93	2.432	1.00	0.30	11.60	

SD: Standard deviation

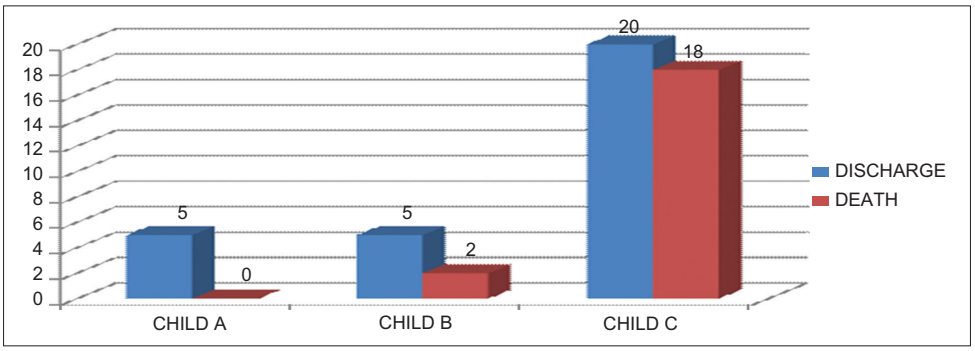

Figure 1: Distribution of child class

Table 2: Bilirubin levels in the study population

Outcome	*n*	Mean	SD	Median	Minimum	Maximum	*P* value
Total bilirubin							
Discharged	30	8.230	9.981	2.585	0.37	31.20	0.267
Death	20	11.719	11.850	7.500	0.60	41.80	
Total	50	9.626	10.788	4.270	0.37	41.80	

SD: Standard deviation

Table 3: Distribution of laboratory values in the study population

	Discharged (*n*=30) (%)	Death (*n*=20) (%)	Total (*n*=50) (%)	*P* value
Serum creatinine				
<0.6	2 (6.7)	1 (5.0)	3 (6.0)	0.128
0.6-1.2	20 (66.7)	8 (40.0)	28 (56.0)	
>1.2	8 (26.7)	11 (55.0)	19 (38.0)	
Total bilirubin				
0.30-1.30	10 (33.3)	2 (10.0)	12 (24.0)	0.058
>1.30	20 (66.7)	18 (90.0)	38 (76.0)	
Serum albumin (*N*=49)				
<4.00	30 (100.0)	19 (95.0)	49 (98.0)	
International normalized ratio				
<1.20	1 (3.3)	1 (5.0)	2 (4.0)	0.768
>=1.20	29 (96.7)	19 (95.0)	48 (96.0)	
Serum potassium				
<3.50	7 (23.3)	7 (35.0)	14 (28.0)	0.441
3.50-5.00	19 (63.3)	9 (45.0)	28 (56.0)	
>5.00	4 (13.3)	4 (20.0)	8 (16.0)	
Serum ammonia (*n*=27)				
19.0-70.0	2 (15.4)	1 (7.1)	3 (11.1)	0.496
>70.0	11 (84.6)	13 (92.9)	24 (88.9)	

biochemical, and imaging study) with decompensation. Patient on diuretic therapy and patients on anticoagulation therapy at admission were excluded from the study.

Statistical Methods

The following methods of statistical analysis have been used in this study. Data were entered in Microsoft Excel and analyzed using SPSS (Statistical Package for Social Science, Ver.10.0.5) package.

The results were averaged (mean + standard deviation) for continuous data and number and percentage for dichotomous data are presented in Table 1-7 and Figure 1. Normality of data was tested using Shapiro-Wilk test. The proportions were compared using Chi-square (χ^2) test of significance. Proportion of cases belonging to a specific group of the parameter or having a particular problem was expressed in absolute number and percentage. The Student's *t*-test was used to determine whether there was a statistical difference between groups in the parameters measured if the data is normal. A non-parametric test (distribution-free) used to compare two independent groups of sampled data. The test $P < 0.05$ was accepted as indicating statistical significance.

RESULTS

This study was conducted in KIMS hospital Bangalore from October 2013 to August 2014. Total of 50 patients of decompensated cirrhosis admitted to KIMS were studied. Out of 50 patients with the end-stage liver disease, 20 (40%) died in the hospital due to cirrhosis related complications. For the purpose of analysis, the study population was divided into death group, and discharge group and the parameters were compared between each group.

The average age was 44.7 ± 12.040 years in discharge group and 54.1 ± 9.910 years in death group.

The age span was 26-80 years in discharge group and 35-73 years in death group. There was male preponderance in both the study groups at a ratio of 4:1 in discharge group and 5.6:1 in death group. Gender difference with respect to in-hospital mortality was not statistically significant.

Hepatorenal syndrome was observed in 13 (26%) patients the incidence of which was found to be higher in death group (30%) compared to the discharge group (23.3%). However, there was no statistical significance difference between the two groups.

Mean serum creatinine value was higher in the death group (3.18 mg/dl) compared to discharge group (1.1 mg/dl) which was statistically significant (Table 1).

Total bilirubin level was also higher in death group (11.7 mg/dl) compared to discharge group (8.2 mg/dl) but with little statistical significance (Table 2).

The distribution of laboratory values is given in the Table 3. Serum creatinine level was relatively higher in the non-survivor group (55%) compared to survivor group (26.7%) but the difference was statistically not significant (Table 3).

CTP score was slightly higher in discharge group and there was no statistically significant difference between two groups (Tables 4 and 5).

Totally, 18 (90%) patients in the death group belonged to child Class C compared to 20 (66.67%) patients in the discharge group. Overall, 38 (76%) patients in the study population belonged to child Class C.

DISCUSSION

In the present study, out of 50 patients with end-stage liver disease, 20 patients died within the hospital accounting for 40% in-hospital mortality. In a study conducted by Cholangitas *et al.*, mortality was seen up to 65%.

High mortality in their study was probably due to the higher incidence of life-threatening upper GI bleed (172 out of 312 patients). Of these 172 patients, 115 patients already had complications such as aspiration pneumonia, severe infection or organ failure.

In present study, mean age of patients was 48.5 ± 12.056 years as compared to 49.3 ± 11 years in a study conducted by Cholangitas *et al.*

Table 4: CTP score among the study groups

Mean CTP score	
Discharge group	**Death group**
10.33	10.30

CTP: Child-Turcotte-Pugh

Table 5: Distribution of child class among the study population

Child	*n* (%)		
	Discharge group (*n*=30)	Death group (*n*=20)	Total (*n*=50)
Class A	5 (16.6)	0 (0)	5 (10)
Class B	5 (16.6)	2 (10)	7 (14)
Class C	20 (66.67)	18 (90)	38 (76)

Table 6: Comparison of complications with other studies

	Our study (%)	Cholangitas *et al.*
H. Encephalopathy		
Survivors	40	22
Non-survivors	70	42
Total	52	34.93
P value	0.038	<0.001
Renal failure		
Survivors	23.3	10
Non-survivors	30.0	57
Total	26	40.70
P value	0.599	<0.001

Male patients contributed to 82% of cases in our study unlike 65% in the study conducted by Cholangitas *et al.* This difference is probably because of regional difference in social habits of female patients.

Even though *P*-value for renal failure is not statistically significant in the present study, it was observed that the mean serum creatinine was higher in death group. When serum creatinine alone was compared with the mortality, *P*-value was found to be significant.

The development of renal failure in cirrhotic patients indicates a catastrophic reduction in survival probability, such that it is the predominant factor in end-stage cirrhosis. The CTP score does not contain variables of the renal function, and this may be why it has poor performance.

CTP score was slightly higher in discharge group, and there was no statistically significant difference between two groups (Table 6).

Totally, 18 (90%) patients in the death group belonged to child Class C compared to 20 (66.67%) patients in the discharge group. Overall, 38 (76%) patients in the study population belonged to child class C.

The renal dysfunction in cirrhosis has been divided into two types. The Type I HRS occurs over 2-3 weeks and has high mortality and the Type 2 HRS occurs over a much longer period of time and has a relatively better outcome. Urinary biomarkers are now considered to be more sensitive than serum creatinine for renal failure in cirrhosis. Fagundes *et al.*[14] have reported that urinary neutrophil gelatinase-associated lipocalin is significantly higher in patients with ATN than HRS. These evidences support the functional nature of HRS compared to ATN in cirrhotic patients.

The RIFLE or AKIN criteria has several limitations when used for renal insufficiency in cirrhosis.[15] Hence, these criteria are not used routinely. Cirrhotic patients have less of muscle mass that affects the affects the level of serum creatinine. Therefore "normal" serum creatinine (<1.5 mg/dL) may still indicate significant renal dysfunction.

Table 7: Comparison of serum creatinine with other studies

	Serum creatinine	
	Our study	Cholangitas *et al.*
Survivors	1.10	1.245
Non-survivors	3.18	3.913
Total	1.93	2.579
P value	0.002	<0.001

In conclusion, the renal dysfunction in cirrhosis is mainly functional which occurs secondary to renal vasoconstriction in response to systemic arterial vasodilatation. Because of this renal vasoconstriction, cirrhotic patients have tendency to develop ATN when faced with complications such as gastrointestinal hemorrhage, diarrhea or sepsis.[15]

CONCLUSION

Although Child-Pugh score was higher in death group than the discharge group, it was a poor predictor of in-hospital mortality. Indices of renal dysfunction (i.e., serum creatinine used in this study) was found to be a better predictor of in-hospital mortality. Hence, CTP score may require further modification to include renal parameters or it may be suggested to use CTP score in combination with renal parameters, to improve the in-hospital mortality prediction power.

REFERENCES

1. Child III CG, Turcotte JG. Surgery and Portal Hypertension. Philadelphia: Saunders; 1964. p. 50.
2. Pugh RN, Murray-Lyon IM, Dawson JL, Pietroni MC, Williams R. Transection of the oesophagus for bleeding oesophageal varices. Br J Surg 1973;60:646-9.
3. Robert A, Chazouillères O. Prothrombin time in liver failure: Time, ratio, activity percentage, or international normalized ratio? Hepatology 1996;24:1392-4.
4. Kamath PS, Wiesner RH, Malinchoc M, Kremers W, Therneau TM, Kosberg CL, *et al.* A model to predict survival in patients with end-stage liver disease. Hepatology 2001;33:464-70.
5. Freeman RB Jr, Edwards EB. Liver transplant waiting time does not correlate with waiting list mortality: Implications for liver allocation policy. Liver Transpl 2000;6:543-52.
6. Charlton MR, Wall WJ, Ojo AO, Ginès P, Textor S, Shihab FS, *et al.* Report of the first international liver transplantation society expert panel consensus conference on renal insufficiency in liver transplantation. Liver Transpl 2009;15:S1-34.
7. Eason JD, Gonwa TA, Davis CL, Sung RS, Gerber D, Bloom RD. Proceedings of Consensus Conference on Simultaneous Liver Kidney Transplantation (SLK). Am J Transplant 2008;8:2243-51.
8. Sharma P, Welch K, Eikstadt R, Marrero JA, Fontana RJ, Lok AS. Renal outcomes after liver transplantation in the model for end-stage liver disease era. Liver Transpl 2009;15:1142-8.
9. Nair S, Verma S, Thuluvath PJ. Pretransplant renal function predicts survival in patients undergoing orthotopic liver transplantation. Hepatology 2002;35:1179-85.
10. Cholongitas E, Marelli L, Kerry A, Senzolo M, Goodier DW, Nair D, *et al.* Different methods of creatinine measurement significantly affect MELD scores. Liver Transpl 2007;13:523-9.
11. Francoz C, Glotz D, Moreau R, Durand F. The evaluation of renal function and disease in patients with cirrhosis. J Hepatol 2010;52:605-13.
12. Francoz C, Prié D, Abdelrazek W, Moreau R, Mandot A, Belghiti J, *et al.* Inaccuracies of creatinine and creatinine-based equations in candidates for liver transplantation with low creatinine: Impact on the model for end-stage liver disease score. Liver Transpl 2010;16:1169-77.
13. Lim YS, Larson TS, Benson JT, Kamath PS, Kremers WK, Therneau TM, *et al.* Serum sodium, renal function, and survival of patients with end-stage liver disease. J Hepatol 2010;52:523-8.
14. Fagundes C, Pepin MN, Guevara M. Evaluation of four different urinary biomarkers in the assessment of renal failure in cirrhosis. Role for urinary neutrophil gelatinase associated lipocalin. Hepatology 2011;54:1234A.
15. Wong F, Nadim MK, Kellum JA, Salerno F, Bellomo R, Gerbes A, *et al.* Working Party proposal for a revised classification system of renal dysfunction in patients with cirrhosis. Gut 2011;60:702-9.

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