Original Article

In-Hospital Mortality Among a Cohort of Cirrhotic Patients Admitted to a Tertiary Hospital

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ABSTRACT

Background/Aim: To determine the mortality rate in a cohort of hospitalized patients with cirrhosis and examine their resuscitation status at admission. **Materials and Methods**: A retrospective chart review was conducted of patients with cirrhosis who were admitted to a tertiary care hospital in Riyadh, Saudi Arabia, from January 1, 2009, to December 31, 2009. **Results:** We reviewed 226 cirrhotic patients during the study period. The hospital mortality rate was 35%. A univariate analysis revealed that worse outcomes were seen in patients with advanced age or who had worse child-turcotte-pugh (CPT) scores, worse model for end-stage liver disease (MELD) scores, low albumin and high serum creatinine. Using a multivariate analysis, we found that advanced age (P=0.004) and high MELD (P=0.001) scores were independent risk factors for the mortality of cirrhotic patients. The end-of-life decision were made in 34% of cirrhotic patients, and the majority of deceased patients were "no resuscitation" status (90% vs. 4%, P<0.001). **Conclusions**: The relatively high mortality in cirrhotic patients admitted for care in a tertiary hospital, Saudi Arabia was comparable to that reported in the literature. Furthermore, end-of-life discussions should be addressed early in the hospitalization of cirrhotic patients.

Key Words: Cirrhosis, MELD score, mortality

Cirrhosis is a major global health problem, especially in Saudi Arabia.[1] This is attributed to the relatively high prevalence of viral hepatitis in this country.[2-5] Cirrhosis is the leading cause of death in Asia.[6] In USA, cirrhosis ranks as the tenth most common cause of death.[1] An objective and reproducible scoring system for the severity of liver disease is important for predicting mortality in patients with cirrhosis in general or with specific complications of cirrhosis.[7]

The child–turcotte–pugh (CTP) scoring system was initially developed to evaluate the risk of surgical portosystemic shunt procedures and was subsequently found to predict the long-term survival of cirrhotic patients.[8] However, this classification was developed in the last century and may no longer be accurate, given advances in medical care and technology.[8] A more recently developed prognostic scoring system for patients with cirrhosis, the model for end-stage liver disease (MELD), was developed for selecting cirrhotic patients for shunting.[8,9] The MELD scoring system has been extended to prognosticate for patients with complications of cirrhosis.[7]

The objective of our study was to determine the in-hospital mortality rate among a cohort of hospitalized cirrhotic patients and to evaluate their end-of-life decision during hospital admission.

MATERIALS AND METHODS

Study population

A retrospective chart review was conducted for patients with discharge ICD-9 diagnosis codes corresponding to

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cirrhosis who were admitted to a tertiary care hospital in Riyadh, Saudi Arabia, from January 1, 2009, to December 31, 2009. These patients were adults 18 years or older who had a history and clinical presentation consistent with cirrhosis. The diagnosis of cirrhosis was based on clinical and laboratory evidence including the presence of portal hypertension, endoscopically proven esophageal varices, ascites or abnormal liver function and coagulopathy and/or a liver biopsy showing cirrhosis. The study was approved by the King Abdullah International Medical Research Center and the institutional review board (IRB) of the hospital. The approval allowed for a retrospective chart review without informed consent.

Data collection

The following information was collected from each chart: age, gender, admission creatinine, international normalized ratio (INR), bilirubin, albumin, platelet counts, etiology of cirrhosis (viral hepatitis, alcoholic, autoimmune or cryptogenic), CTP score, MELD score and outcomes were calculated. Patients were followed up until discharge from the hospital or until death, whichever was earlier.

Outcome measures

The outcomes evaluated were the hospital mortality and resuscitation status of hospitalized cirrhotic patients.

Statistical analysis

Continuous data were expressed as means ± standard deviations (SD) and were compared using student's *t*-test. Categorical data were expressed as percentages and compared using a Chi-square test. Statistical significance was defined as a P value less than 0.05. Statistical analysis was performed using Minitab for Windows (release 13.1).

RESULTS

Demographic and clinical characteristics

Over one year, 226 cirrhotic patients were hospitalized. One hundred and forty eight (65%) patients survived, and were discharged from the hospital. The mean age was significantly higher in the non-survivor group (64.4 vs. 59.9, $P < 0.05$). There was no significant difference in gender between survivors and non-survivors. There was a trend toward increased hospital length of stay (LOS) in the non-survivor group compared to survivors (11 days vs. 14.7 days, $P < 0.06$) [Table 1]. The main indication for hospitalization was infection, and there was no significant difference between the two groups regarding the reason for hospitalization [Table 2].

The hospital outcome

Out of 226 hospitalized patients, 78 (35%) died.

The predictors of outcome

The ICU admission (50% vs. 5%, $P < 0.001$), MELD score (22.7 vs. 11.2%, $P < 0.001$) CTP score (9.9 vs. 7.4, $P < 0.001$) and albumin (31.8 vs. 28.1%, $P < 0.001$) were all significantly higher in the non-survivor group. However, there was no significant difference between the two groups regarding platelet count or history of hepatocellular carcinoma. In a univariate analysis, worse outcomes were seen in patients with advanced age, worse CTP scores, worse MELD scores, low albumin and high serum creatinine [Table 2]. These factors were analyzed by multivariate analysis, which revealed that high MELD score and advanced age were independent risk factors for mortality [Table 3].

Resuscitation status

The majority of non-survivor had a "no resuscitation" status versus survival patients (90% vs. 4%, $P < 0.001$).

DISCUSSION

The present study showed that the hospital mortality rate of hospitalized cirrhotic patients was 35%. These results confirm the findings of a recent study from Tunisia where viral etiology, the most common underlying cause of cirrhosis, they found the hospital mortality was 20% and 48% during follow-up

Table 1: Baseline characteristics of hospitalized cirrhotic patents			
Variable *n* **(%)**	**Survivors** **148 (65)**	**Non-survivors** **78 (35)**	*P* **value**
Age in years, mean ± SD	59.8 ± 14.1	64.6 ± 11.5	0.007
Male *n* (%)	96 (65)	42 (54)	0.1
Length of hospital stay mean ± SD	11.0 ± 13.4	14.7 ± 14.9	0.06
No resuscitation, *n* (%)	6 (4)	70 (90)	<0.0001
History of ICU admission, *n* (%)	8 (5)	39 (50)	<0.0001
Etiology of cirrhosis			
Hepatitis B, *n* (%)	27 (18)	16 (21)	0.17
Hepatitis C, *n* (%)	72 (49)	43 (55)	0.85
Cryptogenic, *n* (%)	34 (23)	14 (18)	0.38
Autoimmune, *n* (%)	4 (3)	0	-
Other, *n* (%)	11 (7)	5 (3)	0.77

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Table 2: Univariate analyses of factors associated with hospital mortality

Variable	Survivors	Non-survivors	P value
N (%)	148 (65)	78 (35)	
Child–pugh stage	7.4 ± 2.2	9.9 ± 2.4	<0.0001
Grade A, N (%)	66 (44)	4 (5)	
Grade B, N (%)	53 (36)	31 (40)	
Grade C, N (%)	29 (20)	43 (55)	
MELD, mean ± SD	11.2 ± 7.1	22.7 ± 8.6	<0.0001
Albumin (g/L), mean±SD	31.83 ± 6.7	28.1 ± 6.2	<0.001
Creatinine (μmol/L) mean ±SD	96.7 ± 56.2	189.0 ± 157.0	<0.001
Platelet count (N/μL), mean ±SD	161.8 ± 98.1	150.0 ± 101.0	0.41
Hepatocellular carcinoma, N (%)	62 (42)	39 (50)	0.24
Reason for admission			
Infection, N (%)	77 (52)	44 (56)	0.5
Bleeding, N (%)	39 (26)	15 (19)	0.2
Post-operative, N (%)	13 (8)	8 (10)	0.71
Other, N (%)	19 (13)	11 (14)	0.79

Table 3: Multivariate logistic regression of variables of factors associated with hospital mortality

Variable	Odds ratio	95% CI	P
Age	1.05	1.02-1.08	0.004
Albumin	0.99	0.92-1.06	0.7
CTP	1.11	0.92-1.35	0.29
MELD	1.19	1.12-1.26	0.001

CTP: Child–Turcotte–Pugh, MELD: Model for end-stage liver disease

for a mean period of 22 months.[10] We found that high MELD score and advanced age were independent predictors of mortality. The MELD scoring system is based on the objective variables leading to a fine grading system.[7,11] The MELD score has limitations: it does not include indicators of poor prognosis in cirrhotic patients such as malnutrition and portal hypertension, and it fails to accurately predict mortality in 15 to 20% of patients with cirrhosis.[7] On the other hand, the CTP classification originated more than two decades ago and may no longer be accurate, given the marked advancements in management and medical technology since its introduction.[8] In addition to the three objective variables, the CTP score incorporates the two subjective variables of ascites and severity of encephalopathy, which leads to a coarse grading system. Advanced age was also found to be an independent risk factor for mortality; this may be due to factors that we did not consider, such as coronary artery disease, type of infection, diabetes mellitus and/or cerebrovascular hemorrhage. Actually these scores were initially developed to evaluate the risk of surgical portosystemic shunt procedures and predictor of mortality among patients on the waiting list for liver transplantation.[8] Based on the available data, none of the scoring systems were able to demonstrate satisfactory predictive accuracy.[8,12] In practice, no single tool is able to predict outcomes, and experienced physicians use their knowledge to make expert and informed clinical judgments.[13] In one study, the ICU mortality rate was 83%, and regardless of the reason for admission (related to cirrhosis or not), cirrhosis independently worsened the prognosis of patients admitted to the ICU.[14] The values of the liver disease-specific scores calculated at ICU admission were likely to be altered by concomitant extrahepatic organ failure.[14] Similar ICU findings were reported by Arabi et al, in a study conducted in the same institution, they found that there was no difference between predicted mortality and actual mortality.[13] The majority of cirrhotic patients admitted to the hospital were "full resuscitation." A subanalysis of the SUPPORT study found that more than two-thirds of cirrhotic patients preferred full resuscitation, but the number of DNR orders increased near death.[15] A prospective cohort study found that one-third of hospitalized cirrhotic patients had severe functional limitations two months after hospitalization.[16] Moreover, the outcomes of hospitalized cirrhotic patients were found to be poor[17-19] and should encourage the use of various new antiviral agents and the advent of liver transplantation, both of which increase the possibility of long-term survival.[8] Decision making is frequently limited by the nature of the disease, the availability of treatment and the prognosis. Despite similar prognoses, patients with cirrhosis have been shown to be less likely to have a "no resuscitation" order than patients with lung cancer or AIDS, and this could be due to misunderstandings between the clinician, the patient and the family.[20] In the oncology literature reports that patients often have optimistic misperceptions of their prognosis and frequently request medical therapies that most physicians would consider futile.[21,22] These findings suggest that the discrepancy between patients and physicians regarding the issue of prognosis may be related to physician nondisclosure or optimistic disclosure.[22] In recent years, increased attention has been given to medical decisions at the end of life.[23] We should integrate the goals

of care discussions and documentation into our practices and medical school curricula.[23]

The present study had several limitations, including that it was conducted at a single center; the nature of a retrospective study may have influenced the interpretation of our result and could not assess some potentially significant predictors of outcome (e.g. reversible processes such as pneumonia) because no standard protocol was followed in treating the patients. In addition, most importantly, the sample size was not large.

CONCLUSION

Our findings show that the hospital mortality of cirrhotic patients is high and comparable to that reported in the literature. Discussions regarding resuscitation status and end-of-life decisions should occur early in the hospitalization of cirrhotic patients

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