Arab Journal of Gastroenterology 17 (2016) 159–163

Contents lists available at ScienceDirect

Arab Journal of Gastroenterology

journal homepage: www.elsevier.com/locate/ajg

Original article

Predicting mortality of patients with cirrhosis admitted to medical intensive care unit: An experience of a single tertiary center

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ARTICLE INFO

Article history:
Received 22 August 2016
Accepted 27 November 2016

Keywords:
Cirrhosis
Medical intensive care
Qatar
Mortality
Score systems

ABSTRACT

Background and study aims: Prognosis for patients with cirrhosis admitted to a medical intensive care unit (MICU) is poor and no previous studies have been published from Qatar or other countries in the region to investigate this issue. The objective of this study was to assess the predictors for in-hospital mortality and admission of cirrhotic patients to MICU in a single tertiary hospital in Qatar.
Patients and methods: All adult cirrhotic MICU patients hospitalized from 2007 through 2012 to Hamad General Hospital-Qatar were included. We compared them to cirrhotic patients admitted to medical wards during same period of time. All data were recorded and analyzed with respect to demographic parameters, clinical features and laboratory as well as radiology characteristics on day one of admission to MICU. Cirrhosis diagnosis was established either with a liver biopsy or the combination of physical, laboratory and radiologic findings. Predictors of mortality were defined by logistic regression analysis.
Results: The cohort comprised 109 cirrhotic MICU patients (86.2% males), and their mean age ± SD was 51.6 ± 11.5. MICU-cirrhotic patients had longer hospital stays than medical wards-cirrhotic patients ($p = 0.01$). Admission with severe hepatic encephalopathy, upper gastrointestinal bleeding and SOFA (Sepsis Related Organ Failure Assessment) score were the independent predicting factors for MICU admission. Mortality was higher for the MICU-cirrhotic group than medical wards group (27 (24.8%) deaths vs. 12 (5.3%) deaths, respectively, $p = 0.001$). In multivariate logistic regression analyses, older age > 60 years ($p = 0.04$), APACH-II score ($p = 0.001$) and MELD score ($p = 0.02$) were independent predicting factors for overall mortality.
Conclusion: Severe hepatic encephalopathy, upper gastrointestinal bleeding and SOFA score predict MICU admission of cirrhotic patients. Among MICU cirrhotic patients, older age, APACH-II score and MELD score predict mortality.

Introduction

Liver cirrhosis represents a late stage of progressive hepatic fibrosis characterized by distortion of the hepatic architecture and the formation of regenerative nodules. It is generally considered to be irreversible in its advanced stages, at which point the only option may be liver transplantation [1]. Many causes can result in cirrhosis; the most common causes of cirrhosis worldwide are chronic hepatitis B and C, alcoholic liver disease, and nonalcoholic fatty liver disease [2]. Patients with cirrhosis may be admitted to a medical intensive care unit (MICU) for complications such as variceal bleeding, hepatic encephalopathy or sepsis resulting from spontaneous bacterial peritonitis, chest or urinary tract infection which can cause multiple-organ failure in substantial number of patients.

Despite some evidence suggesting improving outcome in acutely ill patients with cirrhosis [3,4], the overall prognosis for patients with cirrhosis admitted to MICU remained poor with mortality ranges from 44 to 89% [5,6].

Since the initial classification of patients with cirrhosis by Child in 1964 and the subsequent modification by Pugh nine years later [5], stratifying critically ill patients with cirrhosis has been challenging.

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http://dx.doi.org/10.1016/j.ajg.2016.11.003
1687-1979/

Several scoring systems such as the Organ System Failure (OSF) [7], Sepsis Related Organ Failure Assessment (SOFA) [8,9], and the Acute Physiology Age and Chronic Health Evaluation (APACHE) II and III have been designed, to better stratify critically ill patients and to eliminate the subjective criteria and allow scoring of objective criteria in a simplified manner [10]. The Model for End-stage Liver Disease (MELD) score is a scoring system for assessing the severity of chronic liver disease. It was initially developed to predict mortality within three months of surgery in patients who had undergone a transjugular intrahepatic portosystemic shunt procedure, and was subsequently found to be useful in determining prognosis and prioritizing for receipt of a liver transplant [11]. The aims of these scoring systems are to assist in predicting the outcome in critically ill patients. However, the applicability of these to critically ill patients with cirrhosis is still not clear.

The aim of the present study was to identify predictors of admission and mortality in a recent cohort (2007–2012) of patients with cirrhosis admitted to MICU in a tertiary hospital in Qatar, and to compare between the established liver-specific (Child –Pugh and MELD) and Acute Physiology Scores (APACH-II, and SOFA) in such patients.

Patients and methods

Study population

The study cohort includes all patients above the age of 18 years with liver cirrhosis admitted to MICU of Hamad General Hospital during the period 2007–2012. We compared them to cirrhotic patients admitted to medical wards during the same period of time. Data were collected retrospectively from the medical records using a data collection form. It includes: Age, gender, aetiology of liver cirrhosis, presence of other co-morbidities and the cause of admission to MICU. All baseline blood investigations including haemoglobin, white blood cell count, platelet count, urea, creatinine, sodium, potassium, albumin, International Normalized Ratio (INR), bilirubin, lactic acid, arterial blood gases, inspired oxygen concentration (FiO2), oxygenation index (FiO_2PaO_2), and alveolar arterial partial pressure oxygen gradient (A-a gradient) were recorded in the first day of MICU admission. Cirrhosis diagnosis was established either with a liver biopsy or the combination of physical, laboratory and radiologic findings. The characteristics of the cirrhotic patient who were admitted to the medical wards include acute cirrhotic complications such as hepatic encephalopathy, ascites, spontaneous bacterial peritonitis, variceal bleeding, hepato-renal syndrome, and first diagnosis of hepatocellular carcinoma. The criteria for MICU admission at Hamad General Hospital include patients with decompensated liver cirrhosis with one or more of the followings: Major bleeding related to portal hypertension, hepatic encephalopathy Grade 4 or 3 who might have required ventilator assistance, and severe sepsis or septic shock related to spontaneous bacterial peritonitis or other infectious causes.

Scores were calculated for all the patients. These are the Child–Pugh, MELD, MELD-sodium, SAPS-II, APACHE-II and SOFA scores. The aetiology of MICU admission was recorded e.g., severe sepsis, acute renal failure, severe hepatic encephalopathy, variceal bleeding, etc. Moreover, the development of any complication like cardiac arrest, ventilator associated pneumonia, septic shock, or need for haemodialysis was recorded.

The outcome (survival vs. death) was correlated with the clinical variables and the scoring system to estimate what is best to predict the outcome.

Ethical considerations

Ethical approval was obtained from the research ethical committee of Hamad Medical Corporation, Qatar (research approval # 13237/2013)

Statistical Analysis:

Data were analysed using the Statistical Package for Social Sciences (SPSS, Inc., Chicago, IL, Version 20). Descriptive statistics are presented as mean (standard deviation) for continuous data or number (percent) for categorical data. P value (two tailed) <0.05 was considered as statistically significant. Multivariate logistic regression analysis was used to produce the prediction models for admission to medical intensive care unit (MICU) and death outcome in cirrhotic patients admitted to MICU.

Results

Baseline characteristic

The cohort comprised 109 cirrhotic patients admitted to the MICU. These were 94 males (86.2%) and 15 females (13.8.2%). The detailed demographic and clinical characteristics are shown in Table 1. Hepatitis C viral infection was found to be the cause of liver disease in most of the patients. The most frequent reason for admission to the MICU was upper gastrointestinal bleeding.

Cirrhotic patients admitted to MICU had longer median hospital stay (LOS) than cirrhotic patients admitted to medical wards (9 days vs. 5 days, respectively, p = 0.01).

Predictors for hospital admission

As shown in Table 2, admission with severe hepatic encephalopathy, upper gastrointestinal bleeding and SOFA score

Table 1
Demographic and clinical characteristics of 109 cirrhotic patients admitted to the Medical Intensive Care Unit (MICU)*.

Demographic and Clinical Characteristics (N = 109)	
– Age (year): Mean ± SD	51.6 ± 11.5
– Gender: (Male): N (%)	94 (86.2%)
– Direct MICU admission: N (%)	92 (84.4%)
– Ward then MICU admission: N (%)	17 (15.6%)
– Length of stay: Mean ± SD	10.4 ± 11.5
Other Co-morbidities:	*N (%)*
– Diabetes Mellitus	54 (49.5%)
– Hypertension	30 (27.5%)
– Renal failure	9 (8.3%)
Aetiology of cirrhosis:	*N (%)*
– Hepatitis B infection	23 (21.1)
– Hepatitis C infection	37 (33.9)
– Alcoholic	28 (25.7)
– Cryptogenic	26 (23.9)
– Other aetiology**	6 (5.5)
Causes of MICU admission:	*N (%)*
– Gastrointestinal bleeding	69 (63.3%)
– Hepatic encephalopathy	24 (22%)
– Septic shock	14 (12.8%)
– Pneumonia	2 (1.8%)
Outcome:	*N (%)*
– Patients survived	82 (75%)
– Patients died	27 (25%)
*Child-Pugh score****:	*N (%)*
– A	28 (25.7%)
– B	35 (32.1%)
– C	9 (8.3%)

* Data expressed as Mean ± Standard Deviation for continuous variables or number (%) for categorical variables.
** Primary Biliary Cirrhosis and Autoimmune hepatitis.
*** Calculation was based on 72 patients in whom complete data were available.