

# Hepatorenal Syndrome-Acute Kidney Injury in Patients with Liver Cirrhosis Who Were Admitted to Intensive Care Units



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## Introduction

- Acute kidney injury (AKI) is a common and crucial issue for cirrhotic patients, especially who were admitted to intensive care units (ICU).
- Hepatorenal syndrome (HRS) is a special etiology of renal dysfunction for patients with cirrhosis.
- The newly definition and classification of HRS were revised in 2019.
- We aim to assess the association between hepatorenal syndrome-acute kidney injury (HRS-AKI) and clinical outcome in cirrhotic patients admitted to ICU.

## Methods and Materials

- Retrospective electrical multicenter clinical database (Chang Gung Research Database) 2007/01/01-2019/05/31
- Cirrhotic patients with the presence of ascites at the same time when admitted to ICU
- In-hospital outcome: mechanical ventilator (MV) requirement, vasopressors requirement, vasopressor dose (norepinephrine-equivalent dose), length of ICU day, in-hospital mortality, and ICU mortality
- Outcome after discharge: liver transplantation during follow up and 5-year mortality

Variable	Available number	All (n = 3,119)	HRS-AKI (n = 1,721)	Non-HRS-AKI (n = 1,398)	P value
Age, years	3,119	59.3 ± 12.8	59.0 ± 13.0	59.5 ± 12.6	0.281
Male	3,119	2,217 (71.1)	1,233 (71.6)	984 (70.4)	0.441
Comorbidities					
DM	3,119	1,024 (32.8)	603 (35.0)	421 (30.1)	0.004
HTN	3,119	983 (31.5)	546 (31.7)	437 (31.3)	0.780
COPD	3,119	241 (7.7)	132 (7.7)	109 (7.8)	0.895
AMI	3,119	26 (0.8)	16 (0.9)	10 (0.7)	0.513
Heart failure hospitalization	3,119	60 (1.9)	36 (2.1)	24 (1.7)	0.448
Nonmetastatic or hematologic cancer	3,119	140 (4.5)	74 (4.3)	66 (4.7)	0.572
Metastatic cancer	3,119	182 (5.8)	109 (6.3)	73 (5.2)	0.188
CKD	3,119	1,364 (43.7)	933 (54.2)	431 (30.8)	<0.001
Etiology of cirrhosis					
Alcoholism	3,119	1,050 (33.7)	608 (35.3)	442 (31.6)	0.029
HBV infection	3,119	1,283 (41.1)	744 (43.2)	539 (38.6)	0.008
HCV infection	3,119	964 (30.9)	496 (28.8)	468 (33.5)	0.005
Others	3,119	104 (3.3)	65 (3.8)	39 (2.8)	0.127
Laboratory data at the ICU admission day					
Hb, g/dL	3,114	9.5 ± 2.2	9.3 ± 2.1	9.7 ± 2.1	<0.001
Platelet, 1000/ $\mu$ L	3,106	80 [48, 126]	79 [48, 125]	80 [48, 126]	0.781
INR	2,934	1.6 [1.4, 2.1]	1.8 [1.5, 2.4]	1.5 [1.3, 1.8]	<0.001
BUN, mg/dL	2,969	28 [15, 56]	43 [23, 75]	17 [12, 29]	<0.001
Creatinine, mg/dL	3,119	0.85 [0.64, 1.20]	0.80 [0.60, 1.18]	0.90 [0.69, 1.26]	<0.001
Total bilirubin, mg/dL	2,817	3.8 [1.8, 9.3]	5.1 [2.2, 13.0]	2.8 [1.4, 6.1]	<0.001
ALT, U/L	3,019	45 [25, 111]	47 [26, 113]	41 [24, 108]	0.012
Albumin, g/dL	2,696	2.6 ± 0.6	2.5 ± 0.6	2.7 ± 0.6	<0.001

## Results

- Compared to patients without HRS-AKI, those with HRS-AKI had higher prevalence of DM (35.0% vs. 30.1%), and CKD (54.2% vs. 30.8%), were more likely to have alcoholism (35.3% vs. 31.6%) and HBV infection (43.2% vs. 38.6%), and were less likely to have HCV infection (28.8% vs. 33.5%).
- The risk of vasopressors requirement, the norepinephrine-equivalent dose, in-hospital mortality, and ICU mortality was significantly greater in the HRS-AKI group.
- The 5-year mortality risk was significantly greater in patients with HRS-AKI.

Outcome	HRS-AKI (n = 1,721)	Non-HRS-AKI (n = 1,398)	OR or $\beta$ or HR (95% CI)#	P value
In-hospital outcome				
Mechanical ventilator requirement	1,412 (82.0)	1,141 (81.6)	1.02 (0.76–1.38)	0.878
Vasopressor requirement	1,213 (70.5)	698 (49.9)	1.45 (1.16–1.80)	0.001
Vasopressor dose (Norepinephrine-equivalent dose)	0.69 [0.18, 1.72]	0.22 [0.10, 1.03]	0.32 (0.09, 0.56)	0.007
Length of ICU day	8 [3, 16]	8 [4, 17]	-0.45 (-2.03, 1.13)	0.575
In-hospital mortality	1,104 (64.1)	425 (30.4)	1.43 (1.12–1.83)	0.004
ICU mortality	711 (41.3)	220 (15.7)	1.34 (1.02–1.75)	0.035
Outcome after discharge				
Liver transplantation	9 (1.5)	18 (1.8)	0.89 (0.67–1.18)	0.417
5-year mortality	190 (30.8)	245 (25.2)	1.31 (1.14–1.52)	<0.001

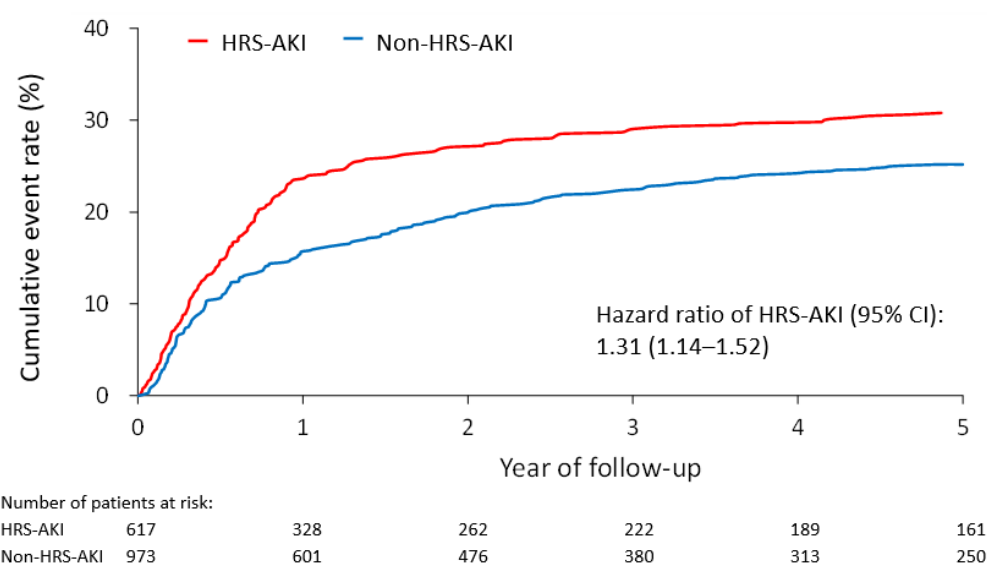


Figure. The cumulative event rate of 5-year mortality after discharge from the index admission of patients with and without HRS-AKI.

## Conclusions

- Cirrhotic patients who were admitted to ICU with HRS-AKI have much poor clinical outcomes than those without HRS-AKI.



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**AKI & CRRT 2023**

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