Infections in Patients with Cirrhosis Have a Changing Profile over Time and Are Linked to a Higher Risk of Death Compared to Patients without Cirrhosis

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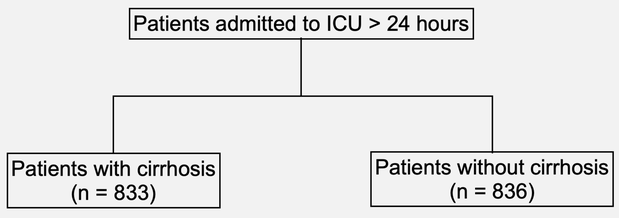
Introduction

- Intensive care units (ICUs) play an important role in the evaluation and management of patients with cirrhosis who develop multi-organ failure.
- Recurrent hospitalizations and repeated exposure to antibiotics may contribute to the emergence of resistant organisms in patients with cirrhosis.
- The aim of this study is to determine the impact of cirrhosis and infections on inpatient mortality over time.

Methods

- Retrospective cohort study with patients with cirrhosis admitted to ICU from 2015-2021.
- Each cirrhosis patient was matched 1:1 to non-cirrhosis patient with respect to age, gender, admission qSOFA, and ICU length of stay in both cohorts.
- Comparisons were made between each group with baseline details, reason for ICU admission, type of infection, organism identified, and overall outcome.
- Logistic regression with death/hospice as the outcome using cirrhosis, qSOFA, Infection, use of vasopressors, and organ failure was performed.
- The culture results were compared over the years from 2015-2021 in the cirrhosis cohort. The presence of gram positive, gram negative, fungal infections as well as VRE/MRSA isolate information were collected.



Results

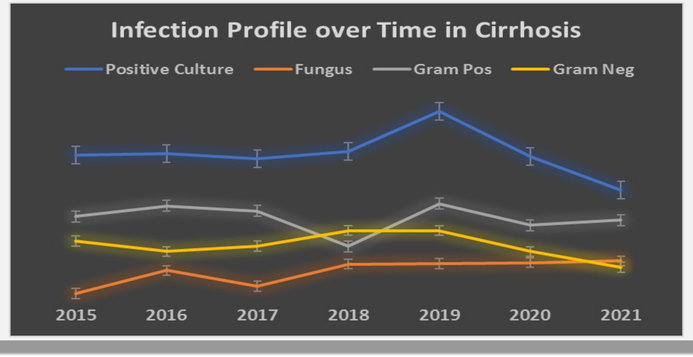
Table 1: Baseline and clinical characteristics of patients with and without cirrhosis

	Cirrhosis Vs No-Cirrhosis		
	No cirrhosis (n=836)	Cirrhosis (n=833)	P value
Age	57.0±12.1	57.0±12.1	0.98
Male Gender	386 (46.2%)	379 (45.5%)	0.78
Race (W/AA/As/Oth/U)	**359 (42.9%)/414 (49.5%)/12 (1.4%)/51 (6.1%)**	**490 (58.8%)/253 (30.4%)/6 (0.7%)/84 (10.1%)**	**<0.0001**
Latinx Ethnicity	16 (1.9%)	20 (2.4%)	0.50
QSOFA	2.47±0.69	2.47±0.69	0.93
WBC	12.3±9.5	11.6±7.8	0.11
Bilirubin	**1.06±2.49**	**7.23±9.92**	**<0.0001**
MELD-Na	**13.9±7.5**	**25.4±9.9**	**<0.0001**
Reason for ICU			
Altered mental status	383 (45.8%)	395 (47.4%)	0.51
Infection	**293 (35.0%)**	**411 (49.3%)**	**<0.0001**
CVA	**116 (13.9%)**	**45 (5.4%)**	**<0.0001**
Hypotension	**273 (32.7%)**	**454 (54.5%)**	**<0.0001**
Renal support	**52 (6.2%)**	**167 (20.0%)**	**<0.0001**
Respiratory failure	**474 (56.7%)**	**399 (47.9%)**	**<0.0001**
Post-procedure	**129 (15.4%)**	**98 (11.8%)**	**0.03**
Type of infection			
Nosocomial?	25 (3.0%)	23 (2.8%)	0.78
Second infection	21 (2.5%)	26 (3.1%)	0.45
UTI	64 (7.7%)	71 (8.5%)	0.52
Abdominal	**24 (2.9%)**	**102 (12.2%)**	**<0.0001**
Bacteremia	**66 (7.9%)**	**104 (12.5%)**	**0.002**
Respiratory	143 (17.1%)	163 (19.6%)	0.19
Skin/soft tissue	22 (2.6%)	23 (2.8%)	0.87
Organism details			
Positive culture?	**169 (20.2%)**	**225 (27.0%)**	**0.001**
Gram positive	**82 (9.8%)**	**116 (13.9%)**	**<0.0001**
Gram negative	63 (7.5%)	82 (9.8%)	0.09
Fungus	**10 (1.2%)**	**33 (4.0%)**	**<0.0001**
>1 organism	16 (1.9%)	25 (3.0%)	0.15
VRE	**3 (0.4%)**	**16 (1.9%)**	**<0.0001**
MRSA	21 (2.5%)	14 (1.7%)	0.23
Fluoro res	12 (1.4%)	9 (1.1%)	0.52
Outcome			
LOS	6.42±7.63	6.48±6.83	0.86
Renal failure	**44 (5.3%)**	**163 (19.6%)**	**<0.0001**
Brain failure	**179 (21.4%)**	**237 (28.5%)**	**0.001**
Shock	**174 (20.8%)**	**310 (37.2%)**	**<0.0001**
Ventilation	331 (39.6%)	334 (40.1%)	0.83
Coagulation failure	**133 (15.9%)**	**545 (65.4%)**	**<0.0001**
Death or hospice	**118 (14.1%)**	**338 (40.6%)**	**<0.0001**

Table 2. Baseline and clinical characteristics of deceased patients or referred to hospice

	Death or Hospice		
	No (n=1213)	Yes (n=456)	P value
Age	56.9±12.2	57.5±11.7	0.32
Male Gender	**538 (44.4%)**	**227 (49.8%)**	**0.05**
Race (W/AA/As/Oth/U)	**597 (49.2%)/521 (43.0%)/13 (1.1%)/82 (6.8%)**	**252 (55.3%)/146 (32.0%)/5 (1.1%)/53 (11.6%)**	**<0.0001**
Latinx Ethnicity	25 (2.1%)	11 (2.4%)	0.66
QSOFA	**2.41±0.73**	**2.63±0.56**	**<0.0001**
WBC	**11.3±8.5**	**13.8±9.0**	**<0.0001**
Bilirubin	**2.56±5.29**	**8.30±11.30**	**<0.0001**
MELD-Na	**16.8±9.2**	**27.1±10.2**	**<0.0001**
Reason for ICU			
Altered mental status	**515 (42.5%)**	**263 (57.7%)**	**<0.0001**
Infection	**427 (35.2%)**	**277 (60.7%)**	**<0.0001**
CVA	**130 (10.7%)**	**31 (6.8%)**	**0.01**
Hypotension	**450 (37.1%)**	**277 (60.7%)**	**<0.0001**
Renal support	**94 (7.7%)**	**125 (27.4%)**	**<0.0001**
Respiratory failure	**593 (48.9%)**	**280 (61.4%)**	**<0.0001**
Post-procedure	**199 (16.4%)**	**28 (6.1%)**	**<0.0001**
Type of infection			
Nosocomial?	**27 (2.2%)**	**21 (4.6%)**	**0.01**
Second infection	36 (3.0%)	11 (2.4%)	0.54
UTI	**84 (6.9%)**	**51(11.2%)**	**0.006**
Abdominal	**68 (5.6%)**	**58 (12.7%)**	**<0.0001**
Bacteremia	**93 (7.7%)**	**78 (17.1%)**	**<0.0001**
Respiratory	**193 (15.9%)**	**113 (24.8%)**	**<0.0001**
Skin/soft tissue	36 (3.0%)	10 (2.2%)	0.38
Organism details			
Positive culture?	**242 (20.0%)**	**152 (33.3%)**	**<0.0001**
Gram positive	**120 (9.9%)**	**78 (17.1%)**	**<0.0001**
Gram negative	**85 (7.0%)**	**60 (13.2%)**	**<0.0001**
Fungus	**21 (1.7%)**	**22 (4.8%)**	**0.001**
>1 organism	**21 (1.7%)**	**20 (4.4%)**	**0.003**
VRE	**7 (0.6%)**	**10 (2.2%)**	**0.006**
MRSA	**20 (1.6%)**	**15 (3.3%)**	**0.05**
Fluoro res	16 (1.3%)	5 (1.1%)	0.71
Outcome			
LOS	**6.18±6.37**	**7.17±9.12**	**0.03**
Renal failure	**90 (7.4%)**	**117 (25.7%)**	**<0.0001**
Brain failure	**254 (20.9%)**	**12 (2.6%)**	**<0.0001**
Shock	**257 (21.2%)**	**227 (49.8%)**	**<0.0001**
Ventilation	**435 (35.9%)**	**230 (50.4%)**	**<0.0001**
Coagulation failure	**374 (30.8%)**	**304 (66.7%)**	**<0.0001**

Figure 1. Time trend of changing infection profile of patients with cirrhosis



Results

- We included 833 patients with cirrhosis and 836 without. Their demographics along with baseline characteristics are displayed (Table 1).
- Patients with cirrhosis were more likely to have an infection on admission and a higher rate of positive cultures (Table 1).
- The rates of death or hospice referral in the cirrhosis cohort was significantly higher (Table 1).
- Death/hospice patients were more likely to have infections as well as higher rates of positive cultures, polymicrobial infections, fungal infections, VRE/MRSA isolation (Table 2).
- Logistic regression for death and hospice referral showed that cirrhosis, admission qSOFA, WBC, presence of infections on admission were significant risk factors.
- There was a significant decrease over time with positive culture and gram-negative infections and an increase in fungal and gram-positive infections (Figure 1).

Conclusion

- Patients with cirrhosis had higher risks of death and organ failure despite matching for demographics and qSOFA scores in intensive care settings.
- Patients with cirrhosis were more likely to have an infection on admission, specifically abdominal infection and bacteremia.
- The types of organisms isolated from culture showed a changing profile over the course of six years. The time trend demonstrated lower rates of positive cultures and gram-negative infections and an increase in fungal and gram-positive infections over time.
- As infection plays a significant role and is an independent predictor in poor outcomes in the cirrhosis cohort, this should encourage re-evaluation of diagnostic and prophylactic strategies targeted for cirrhosis-related infections.