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Spontaneous Bacterial Empyema in Cirrhosis Patients - A Systematic Review and Meta-Analysis

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Results: A total of 91 patients (67% male, mean BMI 30, 21% NASH and 23% related to alcohol use) were included in the study among which 48 (53%) were not on NSBB at admission. Fifty-seven (63%) patients had permissible vital signs for NSBB initiation; however, only 46 (80%) of these patients were initiated on NSBBs at discharge. After group stratification, 60 patients were admitted with their first VH, of which 22 (37%) were on NSBBs prior to admission. Of the 38 patients not on NSBB prior to admission, 23 patients had blood pressures permissible for NSBB use at discharge but only 14 (61%) of these patients were discharged on NSBBs. Of the 31 patients with recurrent VH, only 21 (68%) were on NSBB prior to admission. For the remaining 10 patients not on NSBBs, 5 were eligible for NSBBs at discharge, but only 3 (60%) were appropriately discharged on NSBBs. For those taking NSBBs prior to admission, 100% of patients eligible for NSBB therapy at discharge were indeed discharged on a NSBB regardless of history of VH.

Conclusion: About 40% of the patients admitted for VH with permissible vital signs for NSBB use at discharge were not prescribed NSBBs. This was similar in those that presented either with their first or recurrent VH. However, NSBB use was continued among all patients who were already on NSBB at the time of admission. Further studies to investigate the implementation of quality assurance measures to improve the utilization of NSBBs for reducing the risk of recurrent VH are needed.

S1218

Gender Differences in Cirrhosis: Analysis of Demographics, Outcomes and Healthcare Utilization From a National Database

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Introduction: Cirrhosis is 8th leading cause of death in US. A smaller national study, restricted to cirrhosis related admissions, reported limited outcomes by gender. We studied prevalence of cirrhosis etiologies, outcomes, demographics and healthcare utilization by gender of all patients with diagnosis of cirrhosis using a national sample.

Methods: The US Healthcare Cost & Utilization Project National Inpatient Sample (HCUP-NIS) 2016-2018 was queried to identify all patients with cirrhosis using ICD-10 codes. We studied patient and hospital demographics, comorbidities, cirrhosis etiologies, complications, mean length of stay (LOS), mean Total Hospital Charges (THC), adjusted odds ratio (aOR) for all-cause mortality for men vs women. Statistical analysis utilized chi-square test, univariate and multinomial logistic regression.

Results: We identified 1,359,684 admissions in Men and 918,905 in Women with cirrhosis. Women were significantly older (mean age 61.5 vs 59.6 yrs, $P < 0.001$), less Hispanic (15% vs 17%, $P < 0.001$), more White (67% vs 65%, $P < 0.001$). Both groups had similar Black (11% each) and Asian (2% each) patients. Women were more likely to be treated in small rural, non-teaching hospitals, more likely to be on Medicare and less on Private insurance (all $P < 0.001$). Cirrhosis etiologies HBV/HCV, alcohol, hemochromatosis significantly higher in men while NASH/NAFLD, autoimmune hepatitis, primary biliary cirrhosis higher in women (all $P < 0.001$). All cirrhosis related complications (Table 1) were significantly higher in men except hepatic failure, hepatic coma higher in women (all $P < 0.01$). Women were less likely to undergo transplant. Medical co-morbidity prevalence was mixed - men had higher hypertension, CAD, CKD, smoking rates and women had higher diabetes, dyslipidemia, obesity. Secondary complications showed AKI, thrombocytopenia higher in men, anemia higher in women (all $P < 0.01$) and similar rates of sepsis. Adjusted mortality was lower in women, aOR 0.91 (0.88-0.93, $P < 0.001$). Men had higher LOS (6.25 vs 6.12 days, $P = 0.01$) and THC ($71,840 vs $67,340, $P < 0.001$, adjusted for patient/hospital demographics).

Conclusion: Our study, largest to date, showed that despite being significantly younger and treated at large, urban and teaching hospitals, men with cirrhosis had significantly higher cirrhosis related complications, mortality and healthcare utilization. Further studies are needed to identify causes of higher complications in men with cirrhosis to improve outcomes and decrease costs.

[1218] **Table 1. Cirrhosis Complications by gender.**

Complication	Men (%)	Women (%)	p-value
Portal Hypertension	**27**	25.3	< 0.0001
Portal Gastropathy	**9.1**	7.8	< 0.0001
Esophageal Varices	**19.3**	16.2	< 0.0001
Variceal UGI Bleed	**5.5**	3.8	< 0.0001
Non-Variceal UGI Bleed	**2.9**	2.5	< 0.0001
Ascites	**38.8**	35.2	< 0.0001
SBP	**3.3**	2.8	< 0.0001
Portal Vein Thrombosis	**2.9**	2.4	< 0.0001
Splenomegaly	3.7	3.6	0.06
Hepatic Failure	22.5	**24.0**	< 0.0001
Hepatic Coma	0.49	**0.57**	0.0002
Hepatocellular Cancer	**6.0**	2.8	< 0.0001
Liver Transplant	**0.7**	0.57	< 0.0001

S1219

Differences in Epidemiology, Outcomes and Healthcare Utilization Amongst White, African American and Hispanic Patients With Cirrhosis: A National Database Study

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Introduction: Racial disparities in healthcare are well documented. A previous national study focused on admitting hospital characteristics in patients solely admitted with decompensated cirrhosis showed no difference in mortality by race (J Racial Ethn Health Disparities 2017;4(2):243-51). Our study assessed prevalence of epidemiological differences, outcomes and healthcare utilization of cirrhosis by race in all admissions from a national database.

Methods: The US Healthcare Cost & Utilization Project's National Inpatient Sample (HCUP-NIS) 2016-2018 was queried to identify patients with cirrhosis using ICD-10 codes. We studied patient and hospital demographics, comorbidities, cirrhosis etiologies, complications, mean length of stay (mLOS), mean Total Hospital Charges (mTHC), all-cause mortality for White (WH), African American (AA) and Hispanic (HISP) patients. Statistical analysis utilized chi-square test, univariate and multinomial logistic regression.

Results: Of all inpatients with cirrhosis, 1,459,494 were WH, 247,375 AA and 363,370 HISP. HISP were youngest (mean age 58.5 yrs vs 59.1 AA, 61.2 WH, $P < 0.001$) with least women (36.6% vs 41.4% AA, 41% WH, $P < 0.0001$). AA and HISP were treated at large, urban teaching hospitals and more on Medicaid compared to WH (all $P < 0.0001$). AA had highest mLOS (6.9 days vs 6.0 HISP, 6.1 WH, $P < 0.001$) while HISP had highest mTHC ($80,256 vs $71,297 AA, $66,016 WH, $P < 0.001$, adjusted for patient and hospital demographics). Cirrhosis etiologies showed Hepatitis B/C highest in AA, Alcoholism/alcoholic cirrhosis highest in HISP while NASH/NAFLD highest in WH. All cirrhosis complications were highest in HISP and lowest in AA (all $P < 0.001$) (Table 1). Rates of HCC were similar in HISP and AA ($P < 0.0001$) while hepatic transplant was lowest in AA ($P = 0.001$). Rates of medical co-morbidities were mixed- HISP with highest rates of diabetes, WH with highest hypertension, dyslipidemia, COPD, smoking, obesity while AA with highest CAD, heart failure and CKD (all $P < 0.0001$). Mortality was highest in AA (adjusted for patient and hospital demographics, medical co-morbidities ($P < 0.001$).

Conclusion: The current analysis, the largest to date, shows significant racial disparities with Hispanics having the highest rates of cirrhosis complications and mTHC while AA had highest mLOS and adjusted mortality despite lowest prevalence of cirrhosis complications. This raises the question whether AA patients with cirrhosis face more barriers to timely access to care, thereby delaying care.

S1220

Spontaneous Bacterial Empyema in Cirrhosis Patients - A Systematic Review and Meta-Analysis

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Introduction: Spontaneous bacterial empyema (SBE), defined as spontaneous infection of the pleural fluid, represents a distinct and often underdiagnosed complication of hepatic hydrothorax in patients with cirrhosis. Although the transudative nature of hepatic hydrothorax is well established, the characteristics and risk factors for SBE have not been well investigated. We performed a systematic review and meta-analysis on the incidence and risk factors for this elusive entity.

Methods: A systematic and detailed search was run in June 2021 with the assistance of a medical librarian for studies reporting on the incidence, associations, and outcomes of SBE in cirrhosis patients. Meta-analysis was performed using random-effects model and results were expressed in terms of pooled proportions along with relevant 95% confidence intervals (CI).

Results: Eight studies with 8899 cirrhosis patients were included in the final analysis. Mean age ranged from 41.2 to 69.7 years. Majority were Child-Pugh B and C. The diagnostic criteria of SBE were positive pleural fluid culture and polymorphonuclear leukocytes (PMN) count >250 cells/mm^3 or negative pleural fluid culture and PMN count >500 cells/mm^3, without evidence of pneumonia/parapneumonic effusion on imaging. A total of 1334 patients had pleural effusions and the pooled incidence of SBE was 15.6% (CI 12.6-19; I^2 50). A total of 2636 patients had ascites and pooled incidence of SBP among these patients was 22.2% (CI 9.9-42.7; I^2 97.8). Interestingly, the pooled incidence of SBE in patients without concomitant ascites was 9.5% (CI 3.6-22.8; I^2 82.5).

[1219] **Table 1. Cirrhosis Complications.**

Cirrhosis Complication	WH (%)	AA (%)	HISP (%)	p-value
Portal hypertension	26.7	18.2	**29.1**	< 0.0001
Esophageal varices	17.9	12.1	**21.5**	< 0.0001
Variceal UGI Bleed	4.6	3.0	**6.4**	< 0.0001
Portal Gastropathy	8.6	5.4	**10.4**	< 0.0001
SBP	3.0	2.3	**3.5**	< 0.0001
Portal Vein Thrombus	2.6	2.4	**2.8**	< 0.0001
Hepatic Failure	23.0	18.5	**25.6**	< 0.0001
Hepato-renal Syndrome	4.1	3.3	**4.3**	< 0.0001
Hepatocellular cancer	3.9	**5.9**	5.9	< 0.0001
Hepatic Transplant	**0.7**	0.5	**0.7**	0.001

[1220] **Table 1. Study Details.**

Author	Study design	Total Patients	Patients with pleural effusion	Patients with SBE	Patients with ascites	Patients with SBP	SBE W/o Concurrent Ascites	Age (Mean)	Sex (m/f)	Effusion Location Right sided	Left sided	Bilateral	Patients successfully treated	MELD score	Child Pugh Score
Xiol, 1996	Prospective, September 1988 to December 1992, Single center, Spain	120	120/120	16/120	95/120	14/18	6/24	NR	NR	NR	NR	NR	19/24	NR	10.67 (1.20)
Chen, 2003	Prospective, July 1996 to December 1998, Single center, Taiwan	862	132/862	17/132	451/862	104/451	2/411	53.7 (13.2) [17a]	13/4 [17a]	17/17	--	--	NR	NR	11.5 (1.6) [17a]
Chen, 2011	Retrospective, December 2004 to December 2008, Single center, Taiwan	3390	508/3390	81/508	1729/3390	64/1729	4/81	60.0 (12.0) [81a]	55/26 [81a]	60/81	21/81	--	58/81	20.5 (8.0)	9.7 (2.1)
Makhlouf, 2012	Prospective, Cross-sectional, June 2010 to May 2011, Single center, Egypt	901	61/901	16/61	45/901	9/45	4/16	51.1 (11.00) [16a]	15/1 [16a]	53/61	5/61	3/61	NR	NR	0 [Child A], 1 [Child B], 15 [Child C] / 11.8 (1.3)
Mansour, 2013	Prospective, Inpatient Cross-sectional, NR, Single center, Egypt	98	98/98	14/98	94/98	16/94	1/14	49.7 (16.5) [14a]	8/6 [14a]	12/14	1/14	1/14	NR	27.2 (5.7)	NR
Emam, 2015	Prospective, Cross-sectional, May 2013 to May 2014, Single center, Egypt	322	322/322	46/322	0/46	108/322	0/46	56.76 (6.23) [46a]	30/16 [46a]	42/46	2/46	2/46	NR	0 [Child A], 4 [Child B], 42 [Child C]
Abbasi, 2016	Prospective, June 2012 to May 2013, Single center, Pakistan	206	23/206	7/23	152/206	NR	5/23	41.25 (13.593) [206a]	149/57 [206a]	18/23	3/23	2/23	NR	NR	62 [30.09%] [Child A], 61 [29.61%] [Child B], 83 [40.29%] [Child C]
Mohamed, 2017	Prospective, NR, Single center, Egypt	3000	70/3000	5/70	70/3000	17/70	NR	NR	NR	NR	NR	NR	NR	NR	NR

Conclusion: Bacterial infections account for about 30%-50% deaths in patients with cirrhosis and clinicians should have a high index of suspicion for the timely diagnosis and treatment of SBE. Although this entity is thought to arise through the flow of infected ascites from the peritoneal to the pleural cavity via defects in the diaphragm owing to negative intrathoracic pressure, we found that SBE can occur even in the absence of concomitant ascites. Our results suggest that a diagnostic thoracentesis with subsequent analysis of pleural fluid should be performed in cirrhosis patients presenting with pleural effusions.

S1221

Income and Insurance Do Not Correlate With Hepatic Steatosis or Fibrosis

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Introduction: In 2017-2018 the National Health and Nutrition Examination Survey (NHANES) began to include vibration-controlled transient elastography (VCTE). Using VCTE to measure hepatic fibrosis has been found to be more accurate than validated risk scores already available in NHANES. Socioeconomic factors including income and insurance plan can be linked to diet, exercise, and access to healthcare. Our hypothesis is that social determinants of health may correlate with the presence of nonalcoholic fatty liver disease (NAFLD) and advanced fibrosis.

[1221] **Table 1. Baseline Demographic and Clinical Characteristics.**

n=4955	
Age, mean (yrs, SD)	49 (16)
Sex, n (%)	
Male	2349 (47)
Female	2606 (53)
BMI, mean (SD)	30 (7)
Race/ethnicity, n (%)	
White	1695 (62)
African Americans	1185 (12)
Hispanics	1042 (15)
Asians	792 (7)
Other	241 (4)
Liver function tests, mean (SD)	
ALT	22 (14)
AST	22 (11)
Platelet	243 (57)
Creatinine, mean (SD)	0.88 (0.3)
Comorbidities, n (%)	
Diabetes	789 (12)
Hypertension	1871 (33)
Hyperlipidemia	1747 (35)
Insurance, n (%)	
Medicare	415 (6)
Private insurance	2332 (56)
Safety net insurance	1071 (18)
Military and government	388 (7)
Fibroscan, mean (SD)	
kPa	6 (5)
CAP	262 (55)

Methods: Using the NHANES database, we identified all adult patients aged 18 and older from the 2017-2018 surveys with VCTE measurements available. We excluded patients with a history of viral hepatitis, autoimmune hepatitis and heavy drinking. Demographic factors including age, race, insurance plan, income as well as clinical features such as BMI and history of diabetes were included in the analysis. Hepatic fibrosis was measured in kilopascals (kPa) and hepatic steatosis was measured by controlled attenuation parameter (CAP). Correlation between clinical and VCTE measurements was examined using multivariate linear regression.

Results: A total of 4,955 patients were examined. The mean age of the population was 49 years (SD-16). A greater proportion of patients were white (62%) and female (53%). Mean kPa and CAP were 6 kPa and 262 dB/m, respectably. When controlling for age, BMI and history of diabetes, income and insurance plan had no independent effect on the degree of steatosis or fibrosis. When controlling for these same factors, race appeared to be predictive of hepatic steatosis. African American (AA) patients had an inverse relationship with steatosis -19.83; 95% CI (-25.5, -14.1) $P < 0.001$ while Asian patients had a positive relationship with increased steatosis 15.7; 95% CI (11.3, 20.2) $P < 0.001$. A relationship was not seen between race and hepatic fibrosis when controlling for the same variables described above.

Conclusion: This study validates previous findings that Asian race confers an independent risk for liver steatosis from NAFLD while AA race confers a decreased risk even when controlling for age, BMI and diabetes. We also present the novel finding that insurance plan and income, important social determinants of health, do not have an independent effect on hepatic steatosis or fibrosis. As the transient elastography is included in subsequent surveys, it will be an important tool to understand trends in the NAFLD epidemic.

S1222

Predictive Performance of Age and Initial Serum Albumin Compared to Traditional Prognostic Scores in Alcohol-Associated Hepatitis

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Introduction: Multiple laboratory based prognostic scores are recommended in clinical practice guidelines for risk stratification and prognosis in alcohol associated hepatitis (AAH). None of these are very accurate and use of a combination of them is recommended in clinical practice. In our clinical experience, we noted older age and low initial serum albumin as important predictors of poor outcomes in AAH. In this study, we compared predictive performance of age and initial serum albumin for 30-day mortality against Maddrey discriminant function (DF), Model for End-Stage Liver Disease Sodium (MELD-Na) and Age, serum Bilirubin, INR and serum Creatinine (ABIC) score.

Methods: Consecutive adult admissions between January 2016 to December 2020 for symptomatic AAH (defined by alcohol use, evidence of liver injury and total bilirubin >3 mg/dL) to our one academic and two community hospitals, located in a Midwestern USA metropolitan area, were included. DF, MELD-Na and ABIC prognostic scores were calculated from admission lab values. Primary outcome was 30-day mortality. Predictive performance was compared using area under the receiver operator curve (AUROC). Severe AAH was based on admission DF >32 or MELD-Na >20.

Results: A total of 309 patients were admitted with AAH during the study period, median age 46 (IQR: 38-46) years, 195 (63.1%) males, 250 (80.9%) patients were Whites and median BMI was 27.8 (IQR: 23.9-32.3). Overall, 30-day mortality was observed in 55 patients (17.8%). 54 (21.8%) of 248 patients were severe AAH. As shown in Table 1 and Figure 1, AUROC for age alone was 0.65 (0.57-0.73), comparable to DF ($P = 0.707$) but marginally lower than MELD-NA ($P = 0.048$). The AUROC for serum albumin was 0.71 (0.63-0.78), comparable to DF ($P = 0.525$), MELD_NA ($P = 0.319$) and ABIC score ($P = 0.423$). Adding age and serum albumin to DF improved predictive performance significantly, $P = 0.045$.

Conclusion: Easily available age and serum albumin level carry important prognostic value and their addition to DF improve its prognostic performance significantly. These findings need to be validated in an external cohort before being used in clinical practice with confidence.

[1222] **Table 1. Area under receiver operator curve (AUROC) to compare predictive performance of age, serum albumin with DF, MELD-Na and ABIC score.**

Model	Variables	AUROC (95% CI)	Comparison Model, p-values								
			1	2	3	4	5	6	7	8	9
1	Alb + Age	0.75 (0.68 - 0.82)	-								
2	Alb + Age + DF	0.77 (0.71 - 0.84)	0.643	-							
3	Alb + Age + MELD-Na	0.81 (0.75 - 0.87)	0.192	0.395	-						
4	Alb + ABIC	0.72 (0.64 - 0.77)	0.488	0.241	0.041	-					
5	Alb	0.71 (0.63 - 0.78)	0.394	0.183	0.028	0.868	-				
6	Age	0.65 (0.57 - 0.73)	0.067	0.020	0.001	0.246	0.323	-			
7	DF	0.67 (0.60 - 0.75)	0.132	0.045	0.004	0.418	0.525	0.707	-		
8	MELD-Na	0.76 (0.69 - 0.83)	0.888	0.748	0.244	0.402	0.319	0.048	0.098	-	
9	ABIC	0.75 (0.58 - 0.82)	0.964	0.614	0.181	0.520	0.423	0.076	0.147	0.854	-