

Impact of Vitamin D Deficiency on Outcomes in Patients Hospitalized for Cirrhosis: A Propensity Score Matched Analysis

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Introduction & Aim

- Vitamin D is a secosteroid hormone that regulates calcium and bone metabolism
- Previous studies have associated vitamin D deficiency with poor outcomes for various gastrointestinal diseases
- Aim:** To evaluate inpatient outcomes in patients with concomitant vitamin D deficiency and cirrhosis

Methods

Data & Cohort

- 2001-2014 National Inpatient Sample (NIS)
- Diagnosis of cirrhosis with and without vitamin D deficiency [ICD-9 codes]

Baseline Characteristics Observed / Covariates

- Patient Demographics: Age, Race, Sex, Income, Payer
- Hospital Characteristics: Teaching Status, Size, Region
- Clinical Features: Charlson comorbidities,, Admission Status, etiology of liver disease
- Assessed with Rao-Scott Chi-Squared and Mann-Whitney tests

Outcomes Assessment

- Primary Outcomes: Length of stay (LOS), Total In-hospital charges, routine vs non-routine disposition, mortality
- Secondary Outcomes: decompensation complications rates
- Multivariable Poisson and logistic regression
- Controlled for baseline characteristic differences

Results

Table 1: Baseline Characteristics Pre and Post Match

Variable	Group	Pre Match			Post Match		
		No Defvtd (N = 1114215)	Defvtd (N = 4066)	Pvalue	No Defvtd (N = 3373)	Defvtd (N = 3375)	Pvalue
Age (Median)		54 (48 - 64)	58 (52 - 66)	0 **	58 (52 - 67)	58 (52 - 66)	0.867
CCI (Median)		4 (2 - 5)	4 (4 - 6)	0 **	4 (4 - 6)	4 (4 - 6)	0.252
Sex	Female	386016 (34.6%)	1830 (45%)	0 **	1444 (42.8%)	1524 (45.2%)	0.391
	Male	728103 (65.3%)	2236 (55%)		1928 (57.2%)	1851 (54.8%)	
Race	Asian/Pac Is	16693 (1.5%)	58 (1.4%)	0.056	61 (1.8%)	58 (1.7%)	0.528
	Black	84871 (7.6%)	320 (7.9%)		256 (7.6%)	305 (9%)	
	Hispanic	194746 (17.5%)	574 (14.1%)		494 (14.6%)	554 (16.4%)	
	Other	38771 (3.5%)	139 (3.4%)		143 (4.2%)	100 (3%)	
	White	602769 (54.1%)	2485 (61.1%)		2419 (71.7%)	2358 (69.9%)	
Elective	Elective	102389 (9.2%)	543 (13.4%)	0.001 **	356 (10.6%)	444 (13.2%)	0.174
	Non-elective	1009283 (90.6%)	3508 (86.3%)		3017 (89.4%)	2931 (86.8%)	
Teaching Status	Rural	100657 (9%)	256 (6.3%)	0 **	233 (6.9%)	197 (5.8%)	0.689
	Urban Nonteach	436734 (39.2%)	917 (22.6%)		838 (24.8%)	813 (24.1%)	
	Urban Teach	572800 (51.4%)	2806 (69%)		2301 (68.2%)	2365 (70.1%)	
Hospital Region	Midwest	197169 (17.7%)	1153 (28.4%)	0 **	702 (20.8%)	714 (21.2%)	0.993
	Northeast	201632 (18.1%)	563 (13.8%)		547 (16.2%)	538 (15.9%)	
	South	462795 (41.5%)	1485 (36.5%)		1331 (39.5%)	1350 (40%)	
	West	252618 (22.7%)	865 (21.3%)		793 (23.5%)	773 (22.9%)	
Hepatitis C		220670 (19.8%)	588 (14.5%)	0.001 **	505 (15%)	520 (15.4%)	0.845
Hepatitis B		22499 (2%)	40 (1%)	0.037 **	49 (1.5%)	40 (1.2%)	0.664
Alcohol Liver Disease		687809 (61.7%)	2206 (54.3%)	0 **	1838 (54.5%)	1815 (53.8%)	0.782
NAFLD		439277 (39.4%)	1951 (48%)	0 **	1599 (47.4%)	1625 (48.1%)	0.778

Table 2: Multivariable Regressions of Complications and In-hospital outcomes

Outcomes	Cost	Estimate	ConfInterval	Pvalue
		1.759	(1.42 - 2.18)	<0.001*
	Mortality	1.016	(0.61 - 1.7)	0.953
	Disposition	0.998	(0.8 - 1.24)	0.985
	Length of Stay	1.297	(1.08 - 1.55)	0.005*
Complications		Estimate	confInterval	Pvalue
	Acute Kidney Injury	1.382	(1.07 - 1.78)	0.013*
	Chronic Kidney Disease	1.309	(0.99 - 1.72)	0.055
	Thromboembolism	1.461	(0.93 - 2.28)	0.096
	Blood Transfusion	1.452	(1.12 - 1.88)	0.005*
	Ascites	1.088	(0.86 - 1.38)	0.478
	Portal Vein Hypertension	0.901	(0.72 - 1.12)	0.345
	Hepatic Encephalopathy	1.35	(1.02 - 1.78)	0.034*
	Hepatorenal Syndrome	1.678	(1.09 - 2.58)	0.018*
	Jaundice	1.204	(0.66 - 2.19)	0.543
	Hepatocellular Carcinoma	1.636	(0.99 - 2.7)	0.055
	Esophag Varice ex Bleeding	1.285	(0.98 - 1.69)	0.074
	Esophag Varice Bleed	0.644	(0.48 - 0.86)	0.003*
	Spontaneous Peritonitis	1.359	(0.68 - 2.71)	0.383

Results

- 4,066 patients with concomitant vitamin D deficiency and cirrhosis were identified and matched to controls
- Pre-match, patients with concomitant disease were older (58 vs 54, p<0.001), more likely to be female (45% vs 35%, p<0.001), and more likely to have a CCI >=5 (80.6% vs 69.8%, p<0.001)
- Concomitant disease was associated with higher total charges (\$36,781 vs \$29,089, p<0.001) and length of stay (5 vs 4 days, p<0.001), but there was no significant difference in mortality or disposition
- After doubly robust regression adjustment, charges and LOS remained significantly higher (1.759, 95% CI 1.42 – 2.18 and aOR: 1.297, 95% CI 1.08 – 1.55) respectively
- Vitamin D deficiency was associated with higher prevalence rate of decompensation-associated complications including hepatorenal syndrome, hepatic encephalopathy, and acute kidney injury, but the odds of variceal bleeding were lower

Conclusion

- Inpatients with concomitant cirrhosis and vitamin D deficiency have higher cost, LOS, and more decompensation complications
- The observed rate of esophageal varices with mention of bleeding was lower
- Additional research will be necessary to evaluate the role of vitamin D in decompensated cirrhotic patients