

Can Sarcopenia Diagnosed By Hand Grip Strength Provide A Better MELD-Na Cutoff In Predicting Complications Of Cirrhosis?

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ABSTRACT (C0519)

Computerized Tomography (CT) measured Skeletal Muscle Index (SMI) is the best investigation to diagnose sarcopenia. However, in developing countries, it is not feasible due to cost and unavailability. Hand grip strength using hand grip dynamometry is a simple, economical and repeatable bedside tool to assess sarcopenia in cirrhotics. MELD-Na score is a better marker for short term mortality and transplant allocation rather than predicting decompensation events in cirrhotics. In the present study, we showed that hand grip strength with MELD-Na score can correlate with complications of cirrhosis and predict survival.

Methods: A total of 72 patients between December 2019 and June 2021 diagnosed with liver cirrhosis on the basis of imaging were included in our study. Hand grip strength was measured by hand grip dynamometer in the non-dominant hand in sitting position with semi-flexed arm. Mean of three values was taken as final reading. Cut-offs of < 26 kg for men and < 18 kg for women were taken from Asian Working Group for Sarcopenia 2014 consensus. Patients were followed up for a period of 6 months. **Results:** In our study, the prevalence of sarcopenia was 83.3%. The mean MELD-Na score was 20. Presence of sarcopenia correlated with complications like bleeding esophageal varices (p = 0.01), Hepatic Encephalopathy (HE) (p = 0.002) and Hepatorenal Syndrome (HRS) (p = 0.006). On univariate analysis, when MELD-Na was > 20.5, sarcopenia was significantly associated with HE [Odds Ratio (OR), 9.33; 95% confidence interval (CI), 1.86 - 46.68; p = 0.007], bleeding esophageal varices [OR, 4.29; 95% CI, 1.35 - 13.58; p = 0.01] and HRS [OR, 12.43; 95% CI, 1.46 - 105.74; p = 0.02]. The MELD-Na score of more than 20.5 with sarcopenia predicted mortality with sensitivity 100%, specificity 65% and p = 0.038. The estimated survival of sarcopenics at 6 months with MELD-Na > 20.5 was 83.3%. **Discussion:** Hand grip strength is a simple, non-expensive test to diagnose sarcopenia. In resource limited countries, it can be used instead of CT scan measured SMI. As a measure of sarcopenia, it shows a statistically significant association with decompensation events of cirrhosis. In patients not yet listed for transplant, hand grip strength measured sarcopenia along with MELD-Na score cut-off of 20.5 can be utilized to optimize medical treatment, to prevent decompensation, recurrent hospitalization and ensure good quality of life.

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INTRODUCTION

- Sarcopenia in cirrhosis is multifactorial. It is associated with increased mortality rates and poor post-transplant survival.
- Various methods to assess sarcopenia include- CT scan measured Skeletal Muscle Index (SMI) and psoas muscle thickness, Dual Energy X-ray Absorptiometry, Bioimpedance analysis, etc.
- Computerized Tomography (CT) measured Skeletal Muscle Index (SMI) is the best investigation to diagnose sarcopenia. However, in developing countries, it is not feasible due to cost and unavailability.
- Hand grip strength using hand grip dynamometry is a simple, economical and repeatable bedside tool to assess sarcopenia in cirrhotics.
- In the present study, we showed that hand grip strength with MELD-Na score can correlate with complications of cirrhosis and predict survival.

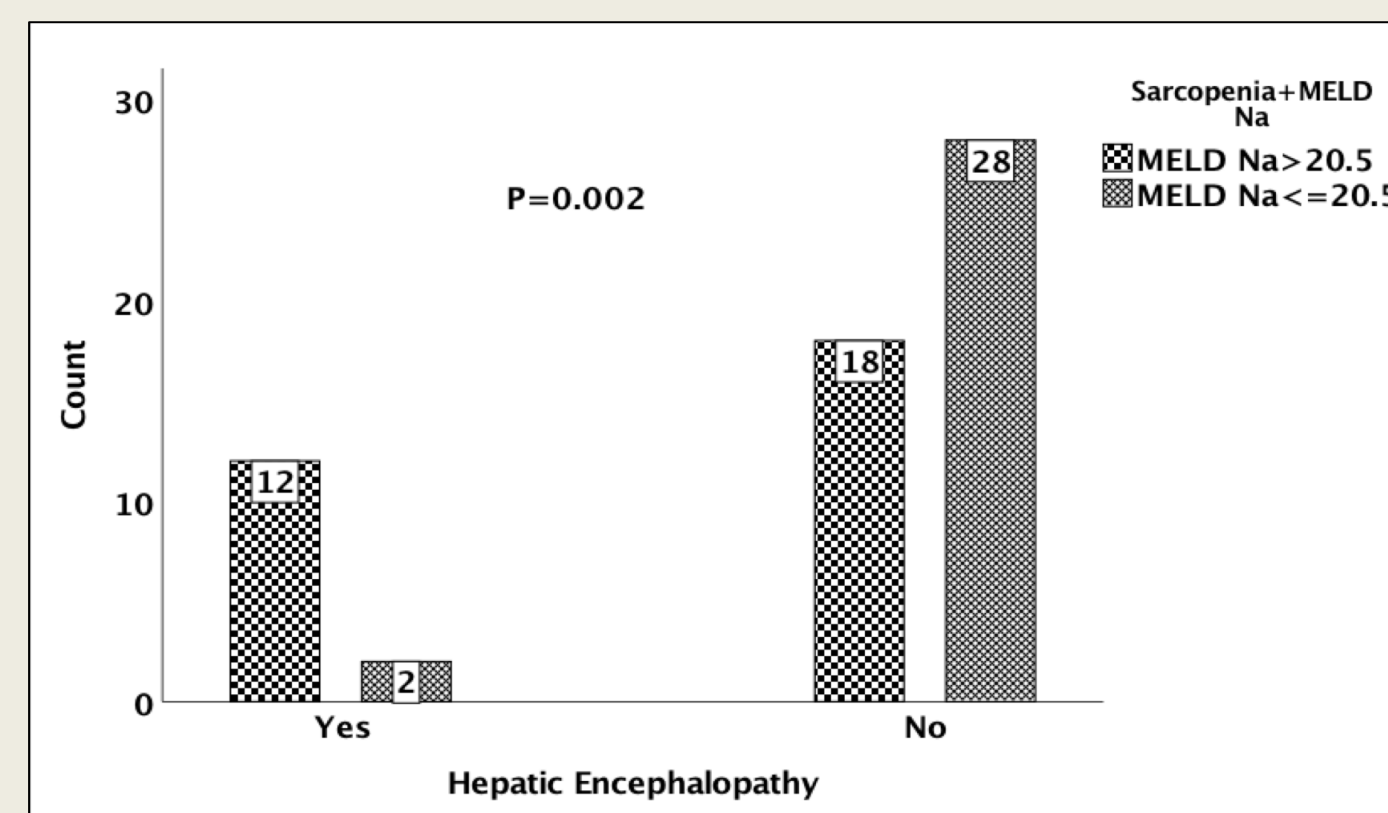
METHODS AND MATERIALS

- Number of patients – 72 diagnosed cases of cirrhosis
- Duration of study – December 2019 to June 2021
- Study design – Prospective study
- Hand grip strength was measured in patient's dominant hand in semi-flexed arm position.
- Average of three values was taken to be final.
- Cut-offs were taken as suggested by Asian Working Group for Sarcopenia 2014 which was $\leq 26\text{kg}$ for men and $\leq 18\text{kg}$ for women.
- All relevant investigations and clinical data was noted.
- MELD-Na and Child Turcotte Pugh (CTP) scores were calculated. Its association with sarcopenia, mortality and rate of complications was studied.
- Patients were followed up for a period of six months.

Sarcopenia	Hepatic Encephalopathy	MELD-Na >20.5	MELD-Na ≤ 20.5	Total	p value	Test performed
Yes	Yes	12 (40%)	2 (6.7%)	14 (23.3%)	0.002	Chi Square test
	No	18 (60%)	28 (93.3%)	46 (76.7%)		
Total		30 (100%)	30 (100%)	60 (100%)		
No	Yes	0 (0%)	1 (11.1%)	1 (8.3%)	1.0	Chi Square test
	No	3 (100%)	8 (88.9%)	11 (91.7%)		
Total		3 (100%)	9 (100%)	12 (100%)		

Table 3. Comparison of Hepatic Encephalopathy between MELD-Na (cut-off 20.5) in sarcopenic and non-sarcopenic patients

- Similarly, presence of sarcopenia showed a statistically significant association with occurrence of hepatic encephalopathy (p value=0.002) when MELD-Na score was >20.5 as compared to non sarcopenics



RESULTS

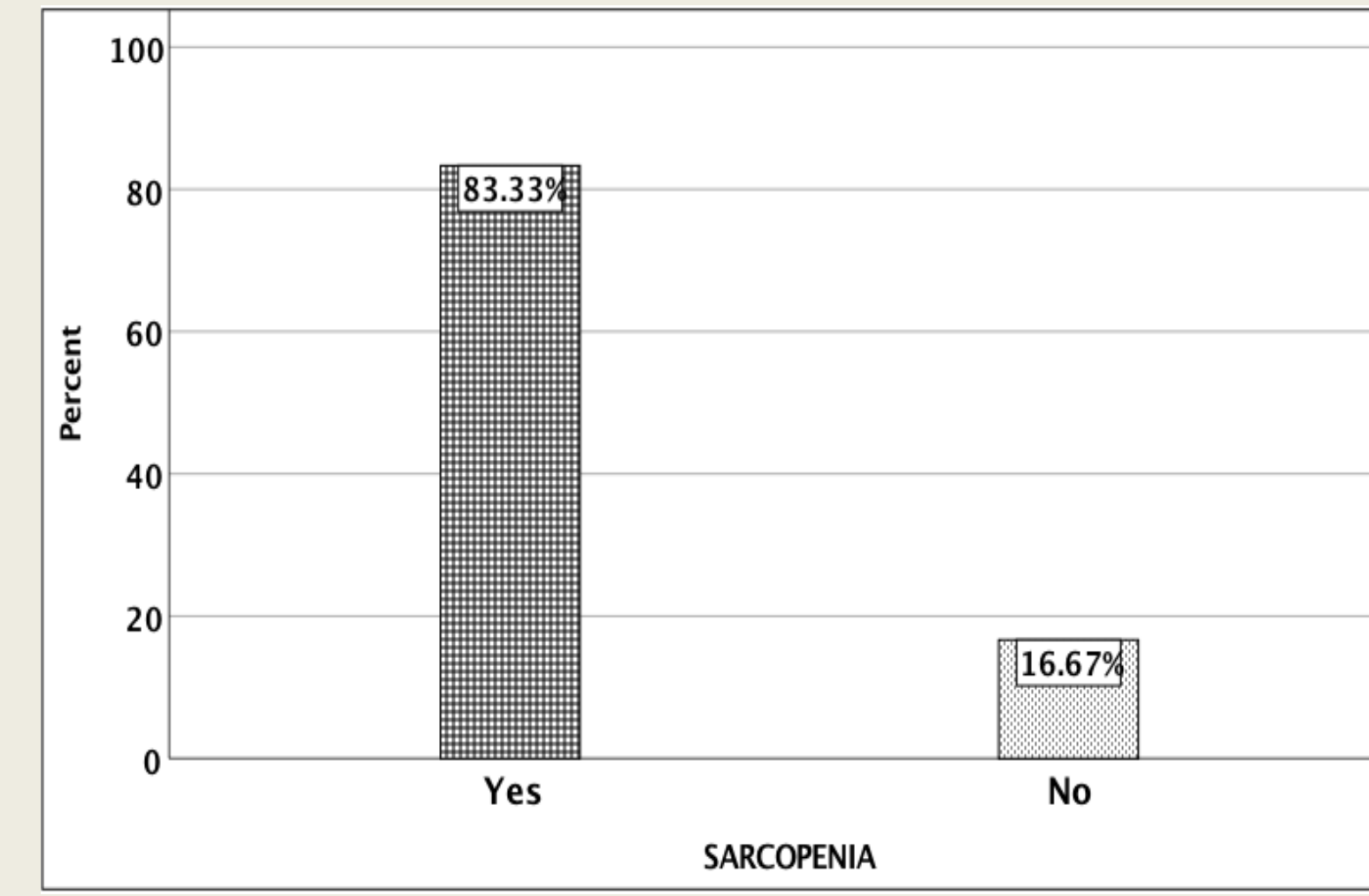


Chart 1. Prevalence of Sarcopenia in cirrhotic patients

- Prevalence of sarcopenia was 83.3%.

MELD-Na	Sarcopenia n=60	No Sarcopenia n=12	p value	Test performed
Mean \pm SD	20.75 \pm 07.59	16.25 \pm 5.69	0.056	t-test
Median	21 (15-27)	14.5 (12.25-20.25)		
Range	8-36	7-28		

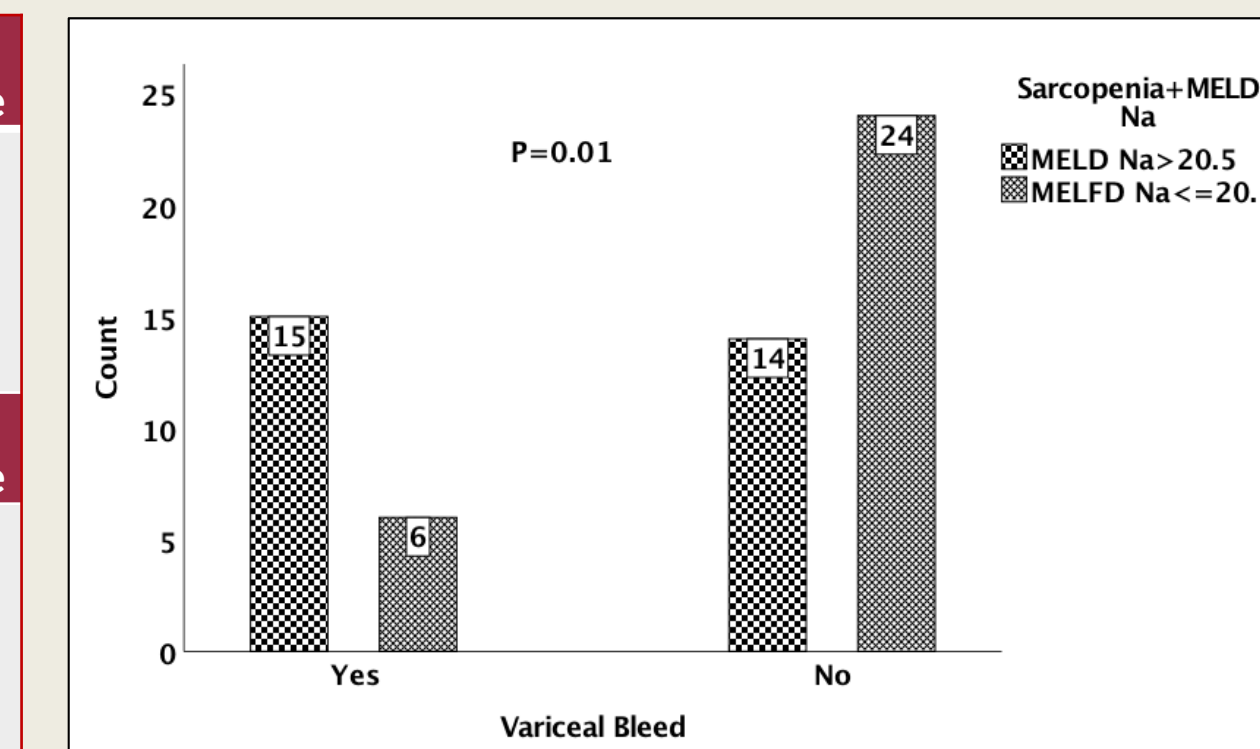
Table 1. Comparison of MELD-Na between patients with and without Sarcopenia

Presence of sarcopenia was independent of MELD-Na score of patients.

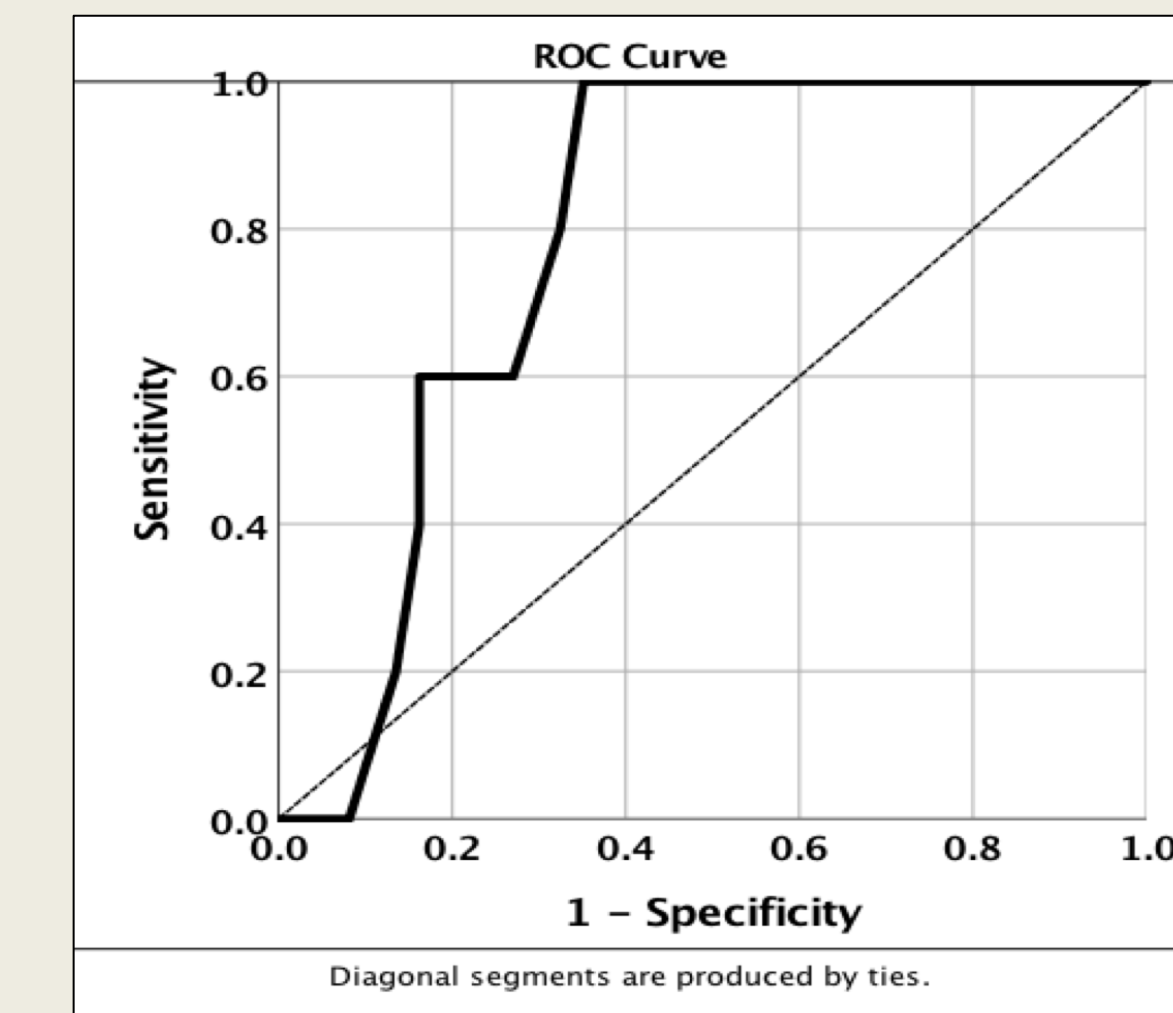
- On binary logistic regression, it was found that Hepatic encephalopathy (OR: 9.33, 95%CI 1.86-46.68, p=0.007), HRS (OR: 12.43, 95%CI 1.46-105.74, p=0.02), Variceal Bleed (OR: 4.29, 95%CI 1.35-13.58, p=0.01) are predictors of Sarcopenia + MELD-Na (>20.5) in univariate analysis whereas Hepatic Encephalopathy (OR: 14.95, 95%CI 2.82-79.38, p=0.001) and HRS (OR: 19.13, 95%CI 2.09-174.78, p = 0.009) in multivariate analysis.

Sarcopenia	Variceal Bleed	MELD-Na >20.5	MELD-Na ≤ 20.5	Total	p value	Test performed
Yes	Yes	15 (51.7%)	6 (20%)	21 (35.6%)	0.01	Chi Square test
	No	14 (48.3%)	24 (80%)	38 (64.4%)		
Total		29 (100%)	30 (100%)	59 (100%)		
No	Yes	0 (0%)	2 (22.2%)	2 (16.7%)	1.0	Chi Square test
	No	3 (100%)	7 (77.8%)	10 (83.3%)		
Total		3 (100%)	9 (100%)	12 (100%)		

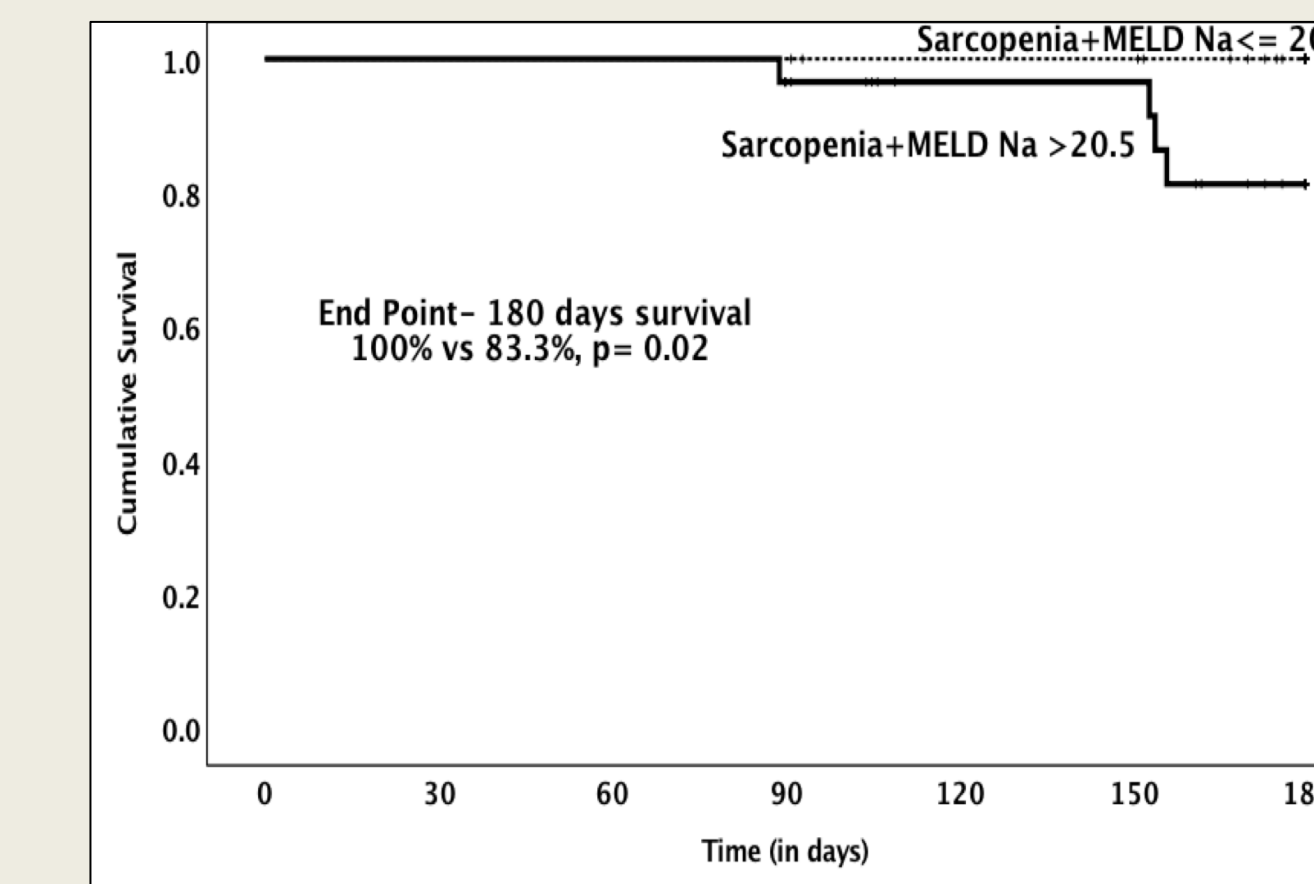
Table 2. Comparison of Variceal bleed between MELD-Na (cut-off 20.5) in sarcopenic and non-sarcopenic patients



- In cirrhotics with sarcopenia, MELD-Na score >20.5 was significantly associated with variceal bleed. (p=0.01). Same significance was not seen in non sarcopenics, even when MELD-Na was more than 20.5.



Graph 1. The Area Under the Receiver Operating Characteristic (AUROC) curve of MELD-Na for predicting mortality in cirrhotics with sarcopenia



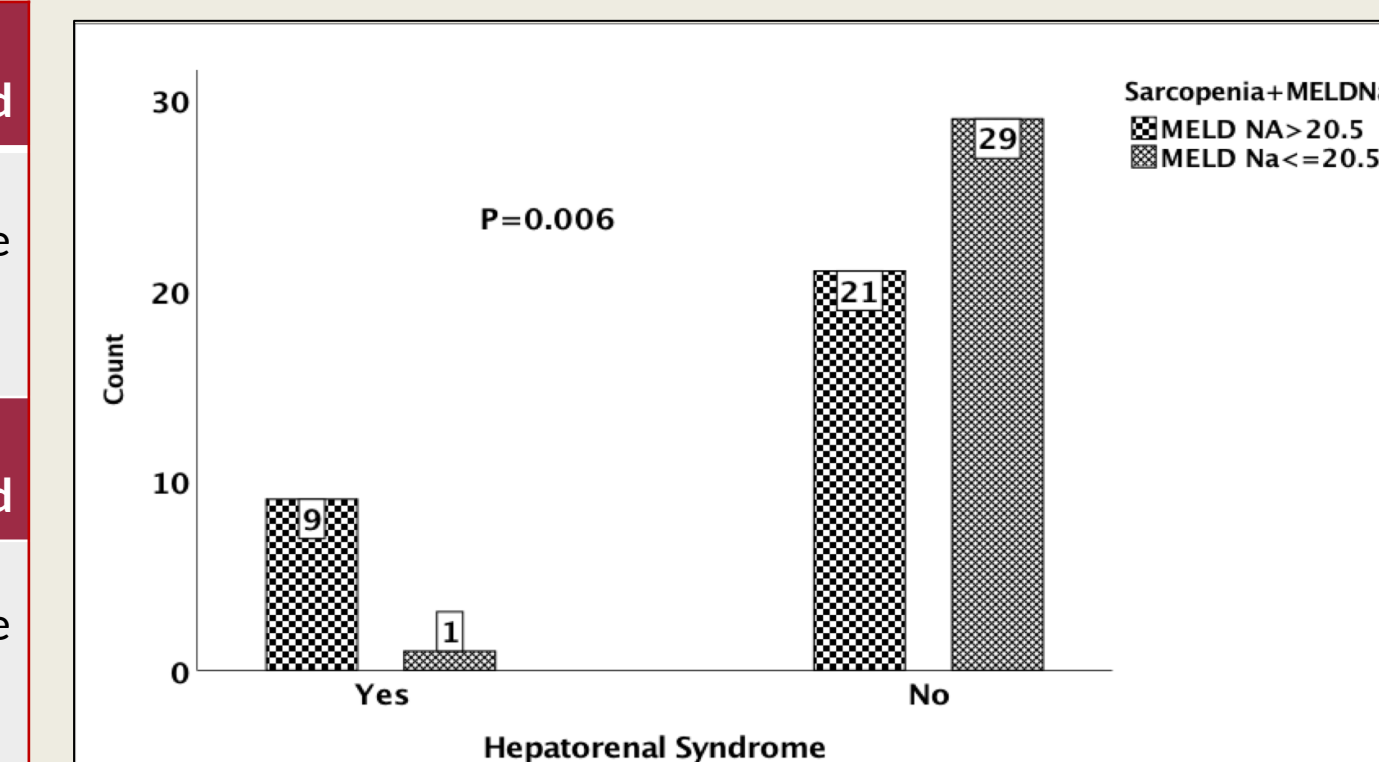
Graph 2. Kaplan Meier Survival Estimate for MELD-Na >20.5 vs MELD-Na ≤ 20.5 with sarcopenia

- Mortality was significantly greater among sarcopenics with MELD-Na >20.5 than sarcopenics with MELD-Na ≤ 20.5
- The estimated survival at 6 months was 83.3% in MELD-Na >20.5, while it was 100% in MELD-Na ≤ 20.5 in sarcopenic patients

Sarcopenia	HRS	MELD-Na >20.5	MELD-Na ≤ 20.5	Total	p value	Test performed
Yes	Yes	9 (30%)	1 (3.3%)	10 (16.7%)	0.006	Chi Square test
	No	21 (70%)	29 (96.7%)	50 (83.3%)		
Total		30 (100%)	30 (100%)	60 (100%)		
No	Yes	1 (33.3%)	2 (22.2%)	3 (25%)	1.0	Chi Square test
	No	2 (66.7%)	7 (77.8%)	9 (75%)		
Total		3 (100%)	9 (100%)	12 (100%)		

Table 4. Comparison of Hepatorenal syndrome (HRS) between MELD-Na (cut-off 20.5) in sarcopenic and non-sarcopenic patients

- Similarly, with p value of 0.006, sarcopenia was significantly associated with hepatorenal syndrome as compared to non sarcopenics, when MELD-Na score was > 20.5.



DISCUSSION

- Sinclair et al. in their study, proved that handgrip strength combined with MELD score is the best predictor of wait list mortality in cirrhotics.[1]
- The prevalence of sarcopenia by impaired handgrip strength was 99% in a study done by Daphnee et al. [2]. Tandon et al. used SMI in their study and noted a prevalence of 42%. [3]
- Kumar et al. showed that presence of sarcopenia in post transplant candidates is associated with poor outcomes, including high mortality, prolonged intensive critical care unit stay, post operative sepsis and neurological complications.[4]
- In a recently published study by Sidhu et al., it was proved that hand grip strength rather than muscle mass correlated with mortality.[5]
- Findings of our study are in accordance of previously published literature. Also, we found that MELD-Na with sarcopenia is significantly associated with occurrence of variceal bleed, hepatic encephalopathy and hepatorenal syndrome, as well as mortality.

CONCLUSIONS

- In a country where liver transplant rates are still low, optimising medical management is very important. MELD-Na is the cornerstone for prognosis in cirrhosis and for transplant allocation. Adding sarcopenia, by hand grip strength, may improve its utility in predicting decompensation events, especially in the patients who are not listed for transplant.
- Hand grip strength is a validated method to diagnose sarcopenia. Its biggest advantage is that it is easy to use, safe and economical.

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