

# MORTALITY AND LENGTH OF HOSPITAL STAY IN PATIENTS WITH LIVER CIRRHOSIS BASED ON THEIR MELD SCORE

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## ABSTRACT

**Objective:** This study aimed to find the frequency of mortality and length of hospital stay in patients with liver cirrhosis based on their MELD score at admission. We also aim to study prognostication in cirrhotic patients using MELD scores at admission.

**Materials and Methods:** A descriptive cross-sectional study was conducted in the Medical Department of Khyber Teaching Hospital Peshawar from 17/10/2019 to 17/4/2020. A total of 100 patients were observed. Investigations required for the calculation of the MELD score were done from the hospital laboratory. Admitted patients were followed for study outcome in-hospital mortality and length of hospital stay for at least 30 days. All information was noted in the predesigned proforma.

**RESULTS:** One hundred patients were analyzed among which the mean age was 53 years with  $SD \pm 7.11$ . Forty-two percent were male and 58% were female. In-hospital mortality was observed in 8(8%) while mean hospital stay was 7 days with a standard deviation  $\pm 4.12$  in patients presenting with liver cirrhosis mortality was observed in patients with a MELD score of less than 20. However, mortality was 6.89% in patients with a MELD score of 20-29 and 42.85 % in those with a MELD score of more than 30.

**Conclusion:** The frequency of in-hospital mortality was 8% and the mean length of hospital stay was  $7 \pm 4.12$  days in patients with liver cirrhosis. For patients with higher MELD scores, the hospital stay and mortality increased.

**Keywords:** in-hospital mortality, mean length of hospital stay, MELD score

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## INTRODUCTION

Cirrhosis is a major global health problem, especially in Pakistan due to the relatively high prevalence of chronic viral hepatitis.<sup>1</sup> Liver cirrhosis causes 1.2 million deaths yearly worldwide, ranking as the 14<sup>th</sup> leading cause of death in the world. Cirrhosis ranks as one of the most common causes of death in our country as well. Hospital mortality secondary to decompensated cirrhosis is high and is one of the leading causes of death in hospitalized patients.

The child-Pughre was first proposed by Child and Turcotte to predict the operative risk in patients undergoing Portosystemic shunt surgery for variceal bleeding and was subsequently found to predict the long-term survival of cirrhotic patients<sup>2,3</sup>. The child-Pugh score includes ascites, hepatic encephalopathy (HE), total bilirubin, albumin, and

prothrombin time or international normalized ratio (INR). Child-Pugh score has been used to assess the severity of liver dysfunction. A more recently developed prognostic scoring system for patients with cirrhosis, the Model for End-stage Liver Disease (MELD), was developed for selecting cirrhotic patients to predict the survival of patients undergoing trans jugular intrahepatic-porto-systemic shunts (TIPS)<sup>4</sup>. The present version of the MELD score incorporates three objective variables, including total bilirubin, creatinine, and INR. Currently, it has been used to rank the priority of liver transplant candidates. The MELD scoring system has been extended to prognosticate for patients with complications of cirrhosis.

Prognostic models are useful for estimating disease severity and survival and can serve as helpful medical decision-making tools for guiding patient care.<sup>5-7</sup> Studies have demonstrated that the MELD score has been useful in predicting mortality in several groups of patients, including patients on the waiting list for liver transplantation, hospitalized patients with hepatic decompensation, ambulatory patients with non-cholestatic liver disease, and patients with primary biliary cholangitis.<sup>8</sup> In a study by Roth et al., the in-hospital mortality was 0.8%, 2.8%, 3.0% and 11.6% while the mean duration of hospitalization in days was 7.2, 8.7, 10.3, and 12.3 in patients with MELD scores of <15, 15-19, 20-29, and >30, respectively.

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This study aims to find the frequency of in-hospital mortality and length of hospital stay in patients with liver cirrhosis based on their MELD score at admission. While the MELD score has been used to allocate organs for liver transplantation, to predict outcomes in patients with cirrhosis undergoing non-transplantation surgical procedures, and to predict mortality in acute alcoholic hepatitis and acute varietal hemorrhage, it has not been used widely for predicting in-hospital mortality and length of hospital stay in cirrhotic patients. We therefore aim to study it for prognostication in cirrhotic patients which will help us regarding advanced directives and patient and attendant counseling in addition to mortality and hospital stay.

The objectives of this study are to determine the frequency of in-hospital mortality and mean length of hospital stay in patients with liver cirrhosis and to compare the mean hospital, stay with MELD score categories in patients presenting with liver cirrhosis.

The different operational definition of MELD score: The MELD score was calculated according to the MELD 2016 formula using the first available routine laboratory data set during the patient's hospital admission:

MELD score =  $11.2 \log_e(\text{INR}) + 3.78 \log_e(\text{serum bilirubin [mg/dL]}) + 9.57 \log_e(\text{serum creatinine [mg/dL]}) + 6.43$ .

It was divided into four categories such as <15, 15-19, 20-29, and >30. The higher the MELD score, the more advanced the liver cirrhosis.

**Liver Cirrhosis:** It was defined as increased liver parenchymal echogenicity on abdominal ultrasound with a duration of at least two years, irrespective of the cause.

**Length of Hospital Stay:** It was defined as death or discharge home of the patient during the current hospitalization.

## MATERIAL AND METHODS

This descriptive cross-sectional study was conducted in the Medical Department of Khyber Teaching Hospital Peshawar. The study was conducted after approval from the ethics and research committees of the hospital. All patients meeting the inclusion criteria were included in the study. A written informed consent was obtained from all patients included in the study. The study was completed in 6 months from 17/10/2019 to 17/4/2020. Based on the available statistics for variables of our interest (i.e. in-hospital mortality), the sample size was 100 taking the mean length of hospital mortality in MELD <15, 7.2 (9 SD) patients with cirrhosis and MELD score of >30, with 95% confidence level using WHO sample size calculator. Consecutive non-probability sampling was used for the collection of data. All adult patients aged 20 to 60 years and of any gender were included in the study. Also, patients admitted with liver cirrhosis of at least two-year

duration irrespective of the cause. Patients on drugs significantly influencing MELD parameters e.g. anticoagulants, vitamin K, etc were excluded from the study. Also, the patients have conditions that affect MELD parameters such as chronic kidney disease, obstructive jaundice, and septicemia. Strict exclusion criteria were followed to limit confounders in the study results.

A detailed history was taken for patients regarding the duration of illness and the number of comorbidities and a relevant clinical examination was performed for vital signs, clinical features, and complications of liver cirrhosis. Investigations required for calculation of MELD scores such as serum creatinine, bilirubin, and INR are done from the hospital laboratory at the patient's admission in addition to baseline investigations such as ultrasound abdomen. The MELD score was calculated according to the formula. MELD score =  $11.2 \log_e(\text{INR}) + 3.78 \log_e(\text{serum bilirubin [mg/dL]}) + 9.57 \log_e(\text{serum creatinine [mg/dL]}) + 6.43$ . Admitted patients were followed for study outcomes in-hospital mortality and length of hospital stay for at least 30 days. All information was noted through a designated proforma. SPSS version 23.0 was used for the analysis of the data. Continuous variables such as age, duration of illness, and length of hospital stay were presented as mean + standard deviation (SD). Qualitative variables such as gender, MELD score, and co-morbidity were presented as frequencies and percentages. The results were stratified against age, gender, duration of illness, co-morbidities, and MELD category. The Chi-square test was used for in-hospital mortality and the independence test was applied for length of hospital stay. P-values were calculated and p-value <0.05 was considered as statistically significant. The results were presented in the form of tables and graphs.

## RESULTS

In this study age distribution among 100 patients was analyzed as 15(15%) patients were in the age range 20-40 years and 85(85%) patients were in the age range 41-60 years. The mean age was 53 years with SD  $\pm 7.11$ . (Table No 1)

Gender distribution among 100 patients was analyzed as 42(42%) patients were male and 58(58%) patients were female. (Table No 1)

Duration of illness among 100 patients was analyzed as 41(41%) patients had a duration of illness  $\leq 5$  years and 59(59%) patients had a duration of illness >5 years. The mean duration of illness was 6 years with SD  $\pm 5.78$ . (Table No 1)

The status of hypertension among 100 patients was analyzed as 83(83%) patients had a history of hypertension and 17(17%) patients were non-hypertensive. (Table No 1)

The status of ischemic heart disease among 100 patients was analyzed as 33(33%) patients had ischemic heart disease while 67(67%) patients didn't have ischemic heart disease. (Table No 1)

The status of diabetes mellitus among 100 patients was analyzed as 26(26%) patients were diabetic and 74(74%) patients were non-diabetic. (Table No 1) MELD Score among 100 patients was analyzed as 22(22%) patients had MELD score <15, 27(27%) patients had MELD score 15-19, 31(31%) patients had MELD score 20-29 and 20(20%) patients had MELD score ≥30. (Table No 1)

The outcome among 100 patients was analyzed as hospital mortality was observed in 8(8%) patients while the mean hospital stay was 7 days with a standard deviation ± 4.12in patients presenting with liver cirrhosis. (Table No 1,2)

Stratification of outcome (in-hospital mortality and mean hospital stay) for age, gender, duration of illness, serious of co-morbidities, and MELD category is given in table 1 and 2

**Table 1A: baseline characteristics of the participants**

AGE DISTRIBUTION	AGE	FREQUENCY	PERCENTAGE
	20-40 years	15	15%
	41-60 years	85	85%
	Total	100	100%
	Mean age = 53 years	Standard Deviation ± 7.11	
GENDER DISTRIBUTION	GENDER	FREQUENCY	PERCENTAGE
	Male	42	42%
	Female	58	58%
	Total	100	100%
DURATION OF ILLNESS	DURATION	FREQUENCY	PERCENTAGE
	≤ 5 years	41	41%
	> 5 years	59	59%
	Total	100	100%
History of HYPERTENSION	History of HYPERTENSION	FREQUENCY	PERCENTAGE
	Yes	83	83%
	No	17	17%
	Total	100	100%
ISCHEMIC HEART DISEASE	ISCHEMIC HEART DISEASE	FREQUENCY	PERCENTAGE
	Yes	33	33%
	No	67	67%
	Total	100	100%
DIABETES MELLITUS	DIABETES	FREQUENCY	PERCENTAGE
	Yes	26	26%
	No	74	74%
	Total	100	100%
MELD SCORE	MELD SCORE	FREQUENCY	PERCENTAGE
	< 15	22	22%
	15-19	27	27%
	20-29	31	31%
	≥30	20	20%
	Total	100	100%
IN-HOSPITAL MORTALITY	MORTALITY	FREQUENCY	PERCENTAGE
	Yes	8	8%
	No	92	92%
	Total	100	100%
The mean hospital stay was 7 days with a standard deviation ± 4.12			

**Table 1B: baseline characteristics of the participants**

STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T AGE	MORTALITY	40-20 years	60-41 years	Total	P value
	Yes	1	7	8	0.8364
	No	14	78	92	
	Total	15	85	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T GENDER	MORTALITY	Male	Female	Total	P value
	Yes	3	5	8	0.7880
	No	39	53	92	
	Total	42	58	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T DURATION OF ILLNESS	MORTALITY	≤ 5 years	> 5 years	Total	P value
	Yes	1	7	8	0.0874
	No	40	52	92	
	Total	41	59	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T HYPERTENSION	MORTALITY	Yes	No	Total	P value
	Yes	6	2	8	0.5299
	No	77	15	92	
	Total	83	17	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T ISCHEMIC HEART DISEASE	MORTALITY	Yes	No	Total	P value
	Yes	4	4	8	0.2863
	No	29	63	92	
	Total	33	67	100	
STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T DIABETES MELLITUS	MORTALITY	Yes	No	Total	P value
	Yes	4	4	8	0.1066
	No	22	70	92	
	Total	26	74	100	

**Table 1C: baseline characteristics of the participants**

STRATIFICATION OF IN-HOSPITAL MORTALITY W.R.T MELD SCORE	MORTALITY	< 15	19-15	29-20	≥30	Total	P value
	Yes	0	0	2	6	8	0.0005
	No	22	27	29	14	92	
	Total	22	27	31	20	100	

## DISCUSSION

Clinical decision support systems have been shown to improve the quality of patient care and the health care costs.<sup>9,10,11</sup> However, little is known about their overall impact on patient outcomes.<sup>12,13</sup> The laboratory-based model for end-stage liver disease (MELD) score reflects the function of the kidney, liver, and extrinsic coagulation pathway and might be used as a general prognostic tool for the assessment of patients<sup>14,15</sup>. The well-established MELD score depends on three readily available laboratory variables, that is, serum creatinine, serum bilirubin, and the international normalized ratio (INR). It has been developed and validated to predict mortality in patients with portal hypertension undergoing placement of transjugular intrahepatic portosystemic shunts.<sup>15-17</sup>

In the current study, 100 patients were analyzed among which the mean age was 53 years with SD ± 7.11. 42% percent of patients were male and 58% of patients

were female. In-hospital, mortality was observed in 8(8%) patients while the mean hospital stay was 7 days with a standard deviation ± 4.12 in patients presenting with liver cirrhosis.

Similar results were observed in another study conducted by Roth JA et al who reported that on admission, MELD scores of 15 to 19, 20 to 29, and ≥30 points (reference <15 points) showed increased hazard ratios (HRs) for in-hospital mortality in uni- and multivariable analysis with an adjusted HR of 2.52 (95% confidence interval [CI], 1.81-3.49; P<.001), 2.70 (95% CI, 1.89-3.84; P<.001), and 8.00 (95% CI, 3.91-16.39; P<.001), respectively.<sup>18</sup> The in-hospital mortality was 7.2%. Increased MELD scores of 15 to 19, 20 to 29, and ≥30 points were positively associated with LOS and the number of comorbidities in uni- and multivariable analysis.

Another study conducted by Yingying Li et al reported that in his study a total of 826 patients with liver cir-

rhosis and AUGIB were included. Median age was 55.27 years (range: 6.28 to 95.13).<sup>19</sup> Among them, 564 (68.3%) patients were male. Major etiology of liver diseases included hepatitis B virus infection (n=208, 25.2%) and alcohol abuse (n=219, 26.5%). A majority of patients had Child-Pugh class B (339/776, 51.4%). The median MELD score at admission was 6.37 (-7.52 to 38.22). Five hundred and twenty-two patients underwent endoscopy. No, mild, moderate, and severe esophageal varices were observed in 32 (6.1%), 24 (4.6%), 54 (10.3%), and 412 (78.9%) patients, respectively. As for the treatment of AUGIB, 508 (61.5%) patients underwent endoscopic therapy, 20 (2.4%) patients underwent Sengstaken Blackmore tube placement, 750 (90.8%) patients received somatostatin and/or octreotide, 544 (65.9%) patients received blood transfusion, 813 (98.4%) patients received PPIs, and 8 (1.0%) patients underwent surgery. Information regarding 5-day rebleeding was unavailable in 4 patients because some of their medical records were missing. Five-day rebleeding rate was 14.0% (115/822). In-hospital mortality was 5.7% (47/826). Median length of hospital stay was 11.23 days (range: 0.06 to 100.55).

Another study conducted by Peng Y et al reported that a total of 145 patients with a diagnosis of liver cirrhosis and acute UGIB between July 2013 and June 2014 were retrospectively analyzed (male/female: 94/51; mean age: 56.77±11.33 years; Child-Pugh class A/B/C: 46/64/35; mean Child-Pugh score: 7.88±2.17; mean MELD score: 7.86±7.22).<sup>20</sup> The in-hospital mortality was 8% (11/145). Areas under the receiving-operator characteristics curve (AUROC) for predicting in-hospital mortality were compared between MELD and Child-Pugh scores. AUROCs for predicting the in-hospital mortality for Child-Pugh and MELD scores were 0.796 (95% confidence interval [CI]: 0.721-0.858) and 0.810 (95% CI: 0.736-0.870), respectively. The discriminative ability was not significantly different between the two scoring systems (P=0.7241).

## CONCLUSION

Our study concludes that the higher the MELD Scores on presentation, the higher the mortality and increased length of stay for the patients with liver cirrhosis. Hence, the MELD score can be used as a tool for the prognosis of these patients.

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**Authors Contribution:**

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Khan HA	✓	x	✓	x	✓	x
Din NU	✓	✓	x	✓	✓	x
Iqbal S	✓	x	x	✓	x	x
Abbas G	x	x	✓	✓	x	✓
Yousaf M	✓	✓	x	x	✓	x
Shah BM	x	✓	✓	x	✓	x
Umam S	x	x	x	✓	x	✓

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**Ethical Approval:**

This Manuscript was approved by the Ethical Review Board of Khyber Medical College, Peshawar Vide No. 721/DME/KMC.

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