ORIGINAL ARTICLE

CORRELATION OF PRE-TRANSPLANT MELD SCORE WITH 30- AND 60-DAYS' MORTALITY IN PATIENTS OF LIVER TRANSPLANT

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Background: The Model for End-Stage Liver Disease (MELD) score, introduced in 2002 by the United Network for Organ Sharing (UNOS), is a vital tool for predicting mortality for liver transplant candidates. Comprising serum creatinine, serum bilirubin, and international normalized ratio (INR), the MELD score includes kidney, liver, and coagulation pathway function, providing a comprehensive prognostic tool. Recent studies suggest broader prognostic implications, extending beyond organ allocation. Despite its benefits, around 15–20% of patients may not experience accurate survival predictions. **Methods:** This retrospective single-center study, covering January 2016 to September 2023 with 87 patients, explores the correlation between pre-transplant MELD scores and 30 to 60-day post-transplant survival. **Results:** Our analysis reveals no significant impact of MELD scores on survival during this period, challenging existing literature (p=0.068). The study underscores the need for nuanced risk assessment beyond MELD scores, considering diverse clinical scenarios and patient-specific variables. **Conclusion:** Our findings contribute to refining predictive models and advocate for larger-scale investigations, emphasizing a holistic approach to optimize liver transplantation outcomes.

Keywords: Model for End-Stage Liver Disease (MELD); Mortality; Liver Transplant; Pre-Transplant Assessment; Organ Sharing

Citation: Khan FR, Khan RSA, Shabbir K, Shehzad A, Siddiqi FA, Khan ZR, *et al*. Correlation of pre-transplant meld score with 30- and 60-days' mortality in patients of liver transplant. J Ayub Med Coll Abbottabad 2024;36(3):556–9.

DOI: 10.55519/JAMC-03-13246

INTRODUCTION

The Model for End-Stage Liver Disease (MELD) score has proven to be a valuable tool for predicting mortality among patients on the liver transplantation waiting list. Introduced on February 26, 2002, by the United Network for Organ Sharing (UNOS), the MELD score serves as a criterion for organ allocation in individuals with chronic diseases awaiting liver transplantation.[1] The well-established MELD score depends on 3 readily available laboratory variables, that is, serum creatinine, serum bilirubin, and the international normalized ratio (INR).[2,3]

The MELD score serves as an indicator of kidney, liver, and extrinsic coagulation pathway function, potentially serving as a comprehensive prognostic tool for evaluating patients.[4] Moreover, the well-established MELD parameters have shown significant associations with patient outcomes across diverse populations, including those with acute heart failure and septic patients.[5–7] Notably, the origin or cause of liver disease was not identified as a significant predictor of mortality.[8]

Currently, the MELD score is mainly employed for organ allocation in liver transplantation. However, recent studies suggest that it could serve as a broader prognostic tool for patients, regardless of the presence of liver disease.[5,9,10] Additionally, the MELD score has shown predictive value in cases of fulminant hepatic failure and alcoholic hepatitis.[11] The MELD score may find relevance in selecting patients for surgeries other than liver transplantation and determining optimal treatment strategies for individuals with hepatocellular carcinoma ineligible for transplantation.[11] Despite the various benefits associated with the MELD score, it is important to note that approximately 15–20% of patients exist for whom the score may not accurately predict survival.[11] Our study objective is to investigate whether there exists a correlation between the MELD score and survival between 30 and 60 days following liver transplantation.

There exists very scanty data regarding liver transplant from Asia and particularly Pakistan. This study would fill the void.

MATERIAL AND METHODS

This study adopted a retrospective single-center design, focusing on patients who underwent liver transplantation between January 1, 2016, and September 30, 2023. Ethical approval was obtained after undergoing scrutiny by the ethical committee (A/28/201, dated September 1, 2022), and informed consent was obtained from all participating patients. The liver transplant surgeries were exclusively conducted by a local team of hepato-biliary surgeons, under the direct supervision of an experienced and senior surgeon.

Patients aged between 6 months to 65 years who presented with decompensated liver cirrhosis, evidenced by complications of portal hypertension, MELD score ranges from 5 to 60 and transplant performed on or after 1st January 2016 were included in this study.

All the patients who were less than 6 months old, hemodynamically unstable, presented with acute liver failure, severe Cardiopulmonary, renal disease, deranged coagulation and who did not give consent for transplant were excluded from the study.

The computation of the MELD score was conducted retrospectively following the adjustments made by the United Network for Organ Sharing to the MELD formula. This process involved utilizing the initial routine laboratory dataset accessible within 48 hours after hospital admission. The formula used for calculating MELD was MELD = 11.2×log (INR) + 3.78×loge (serum bilirubin [mg/dL]) + 9.57×loge (serum creatinine [mg/dL]) +6.43. (1)

The analysis of the relationship between distinct MELD categories and 30 and 60-day mortality utilized the Chi-Square test. All statistical analyses were performed using the software "IBM SPSS Statistics 25," and a *p*-value below .05 was considered statistically non-significant.

RESULTS

The study involved 87 patients, comprising 54 males (62.1%) and 33 females (37.9%), with an average age of 29.9 years (range, 15–72 years). Notably, there were no obese participants, and all individuals belonged to the Asian ethnicity. Of the total, 7 patients (8.0%) reported comorbidities, which included Rickets, Osteoporosis, Renal tubular acidosis, Portal vein thrombosis, Prior upper abdominal surgery, Diabetes Mellitus, and Hypertension. Specifically, Diabetes Mellitus and Hypertension were reported in 2 patients (2.3%), while the remaining patients did not report any comorbidities.

Among the patients, 6 presented with Grade I (6.9%) and two with Grade II (2.3%) Encephalopathy at the transplant, while the remaining patients did not report any such complaints. Furthermore, 26 patients (29.9%) had Grade I ascites, 40 patients (46%) had Grade II ascites, and only 4 patients (4.6%) had Grade III ascites at the time of transplant. Seventeen patients (19.5%) did not have ascites at transplant. In terms of hospitalization, 44 patients (50.6%) were not hospitalized at the time of transplant, 41 patients (47.1%) were hospitalized but not in the ICU, and only 2 patients (2.3%) were hospitalized in the ICU. Regarding pre-transplantation MELD scores, 53 patients (60.9%) had scores below 15, while 34 patients (39.1%) had scores equal to or greater than 15. Interestingly, there was no significant difference in survival between the two extreme MELD score groups at different intervals, and this lack of difference was statistically non-significant ($p = 0.068$).

The causes of liver disease varied among the patients, with Hepatitis C being the most common (20.7%), followed by Cryptogenic cirrhosis in 8 patients (9.2%), and Wilson Disease in 7 patients (8.0%), PFIC in 7 patients (8.0%), and other less frequent causes. Beyond the 60-day mark, survival rates were 88.7% for patients with MELD scores less than 15 and 73.5% for those with MELD scores equal to or greater than 15. Out of 87 cases, 17 patients died of various causes. Causes of death included bile leak, intra-abdominal collection, and sepsis in 3 patients (3.4%), sudden cardiac arrest and hepatocellular carcinoma recurrence in 2 patients (2.3%), primary graft failure in one patient (1.1%), with other causes encompassing multi-organ failure, intrahepatic bileomas, intra-abdominal bleeding, and early graft dysfunction, often associated with sepsis and underlying complications like bacterial pneumonia. These findings highlight the diverse nature of post-transplantation outcomes.

Table-1: Showing Pre-Transplantation survival MELD score

Pre-Transplantation MELD score					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<15	53	60.9	60.9	60.9
	>=15	34	39.1	39.1	100.0
	Total	87	100.0	100.0	

Table-2: Showing post-transplantation survival in relation to MELD score

MELD score * Post Transplant Survival (Days) Crosstabulation					
			Post Transplant Survival (Days)		Total
			Beyond 60 days	Between 30 & 60 days	
MELD score	<15	Count	47	6	53
		% within MELD score	88.7%	11.3%	100.0%
		% within Post Transplant Survival (Days)	65.3%	40.0%	60.9%
	>=15	Count	25	9	34
		% within MELD score	73.5%	26.5%	100.0%
		% within Post Transplant Survival (Days)	34.7%	60.0%	39.1%
Total		Count	72	15	87
		% within MELD score	82.8%	17.2%	100.0%
		% within Post Transplant Survival (Days)	100.0%	100.0%	100.0%

Table-3: Showing non-significant results between MELD and Post Transplant mortality

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.332[a]	1	.068		
Continuity Correction[b]	2.355	1	.125		
Likelihood Ratio	3.252	1	.071		
Fisher's Exact Test				.085	.064
Linear-by-Linear Association	3.293	1	.070		
N of Valid Cases	87				

DISCUSSION

In our experience at a single transplant center, we found that the pre-transplantation MELD score does not significantly impact survival during the 30 to 60-day post-transplant period, contradicting literature suggesting a significant relationship between MELD score and mortality outcomes. This conclusion was supported by a study suggesting that the MELD score lowered waiting-list mortality but had a limited impact on post-transplant outcomes. This study also concluded that Combining MELD with preoperative factors improves complication prediction, highlighting MELD's insufficient predictive power for post-surgery survival.[12]

Some studies propose that MELD alone may not independently influence mortality unless there are associated risk factors, such as alcohol-associated hepatitis and cirrhosis of the liver.[13] Additionally, Patrick *et al*. demonstrated that the utilization of the MELD scale to predict 1-week mortality supports its efficacy in determining short-term outcomes, a finding that contradicts our study.[14] Moreover, their subsequent conclusion that the MELD score might underestimate the severity of liver disease in individuals with a smaller body size further challenges the reliability of MELD as a factor for estimating short-term mortality outcomes.[14] This underscores the variability in human body size, which should be taken into consideration.

While MELD scores showed significant outcomes in patients with esophageal variceal bleeding,[15] another study found that elevated MELD scores were linked to increased postoperative morbidity and mortality rates in individuals undergoing pericardiectomy for constrictive pericarditis[15]. These findings collectively suggest that relying solely on the MELD score may not be a reliable factor for assessing short-term post-transplant mortality, as its predictive value can be influenced by various factors and conditions.

Special consideration is needed for patients who have undergone transplantation for chronic hepatitis B.[1] However, the relatively small number of individuals in this subgroup within our study prevented a valid comparison regarding outcomes linked to the MELD score. The transplantation waiting list encompasses a diverse group of patients, and it is crucial to uphold equity between individuals with high or intermediate severity cirrhosis and those with hepatocellular carcinoma (HCC). Managing patients on the waiting list is a vital factor contributing to the overall success of liver transplantation. (16) The divergent findings from our study emphasize the need for caution when relying solely on MELD scores to assess short-term post-transplant mortality, recognizing the influence of diverse factors and conditions.

CONCLUSION

In conclusion, our retrospective case series investigated the correlation between pre-transplant MELD scores and short-term mortality in liver transplant recipients. Contrary to existing literature, our findings from a single transplant center challenge the notion that higher pre-transplantation MELD scores necessarily predict increased survival rates in the 30 to 60-day post-transplant period. The study highlighted the multifaceted nature of this relationship, emphasizing the need for a nuanced understanding that considers associated risk factors, diverse clinical scenarios, and patient-specific variables, such as body size. The diverse causes of

post-transplant mortality underscore the complexity of outcomes, urging a comprehensive approach to patient management and further research to refine predictive models.

As we navigate the complexities of liver transplantation, our study emphasizes the significance of enhancing risk assessment methods beyond the MELD score and recognizing the limitations in predicting short-term mortality in specific patient subgroups. While acknowledging the challenges of subgroup analyses, particularly in cases like chronic hepatitis B, the study advocates for larger-scale investigations to enhance statistical power and validity. Ultimately, our findings contribute to the ongoing discourse on optimizing patient outcomes in liver transplantation, emphasizing the need for a holistic approach to risk assessment and patient management on the transplantation waiting list to ensure the continued success of this life-saving procedure.

AUTHORS' CONTRIBUTION

FRK: Data collection, write-up. RSAK: Data collection, analysis. KS: Study design. AS: Literature search. FAS: Write-up. ZRK: Data collection. S: Data analysis.

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Submitted: April 16, 2024	*Revised: June 6, 2024*	*Accepted: June 6, 2024*

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