

# MELD and MELDNa Scores as Predictors of Short term Prognosis in patients with End Stage liver disease

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## ABSTRACT

**Objectives:** To assess the clinical use of MELD and MELDNa scores as a predictor of short term prognosis in patients with cirrhosis in our population.

**Study design:** Cross-sectional survey.

**Settings:** Medical unit IV, Services hospital Lahore, Pakistan.

**Duration:** June, 2009 to May, 2010

**Results:** A total of 300 patients were included. All of them had end stage liver disease. Patients were admitted through emergency and outpatient department. MELD and MELD Na score were calculated at the time of admission. The average MELD, MELD-Na of survival group was  $13.8 \pm 8.959$ ,  $14.55 \pm 8.78$  respectively, and those of dead group were  $20.1387 \pm 10.02$ ,  $21.25 \pm 10.21$  on admission. There was a significant difference in MELD and MELD –Na between the dead and survival group ( $p$ -value=0.00)

**Conclusion:** MELD and MELD –Na score are equally good to predict short term prognosis i.e. at 3 months in patients with end stage liver disease.

**Key words:** HCV, cirrhosis, MELD, MELDNa, Correlation.

## INTRODUCTION

Pakistan bears most of the burden of morbidity due to chronic hepatitis and mortality due to liver failure and hepatocellular carcinoma. Hepatitis B and hepatitis C virus are among the principal causes of end stage liver disease<sup>1</sup>. Cirrhosis is the end stage of chronic liver disease<sup>2</sup>. End stage liver disease has no specific treatment except management of complications. Liver transplantation now is the only hope that has shown to improve prognosis in these patients<sup>3</sup>. Survival rates in patients receiving liver transplantation is 80% at 3 years<sup>4</sup>. However in Pakistan liver transplantation is not available yet, so morbidity and mortality associated with liver cirrhosis consumes a lot of resources. Therefore it is necessary to observe different factors that are involved in prognosis of cirrhotic patients. MELD score is used to assess prognosis of cirrhotic patients. The major use of MELD score is in allocation of organs for liver transplantation<sup>5,6</sup>. However MELD score has also been shown to predict survival in patients with cirrhosis with complications such as encephalopathy, variceal bleed, as well as in patients with fulminant hepatic failure and alcoholic hepatitis<sup>7</sup>.

This score is calculated by using three readily available laboratory tests, serum bilirubin, serum creatinine and the international normalized ratio for the prothrombin time, with higher scores indicating a greater early need for liver transplantation. This score accurately predicts mortality in patients with end stage liver disease<sup>8</sup>. However several studies have shown that some cirrhotic patients may have high mortality despite having low MELD scores. Therefore there is need to improve MELD score<sup>9</sup>. Natural history of cirrhosis has shown that patients with hyponatremia have poor short term prognosis and in this regard serum sodium has independent prognostic value<sup>8</sup>. The serum sodium is readily available and economical, so it is a suitable variable in predictor model<sup>10</sup>. Low serum sodium in these patients has been associated with hepatorenal syndrome, ascites and death from liver disease<sup>10,11</sup>.

In Pakistan limited work has been done on MELD and MELD Na score. We therefore aim to apply MELD and MELD Na scoring system in our population presenting with various complications of end stage liver disease and their usefulness as predictor of short term outcome in these patients.

## MATERIAL & METHODS

About 300 patients of greater than 18 yrs of age of both sexes, with end stage liver disease diagnosed on the basis of clinical, laboratory and radiological criteria, admitted in medical unit 4 of services hospital

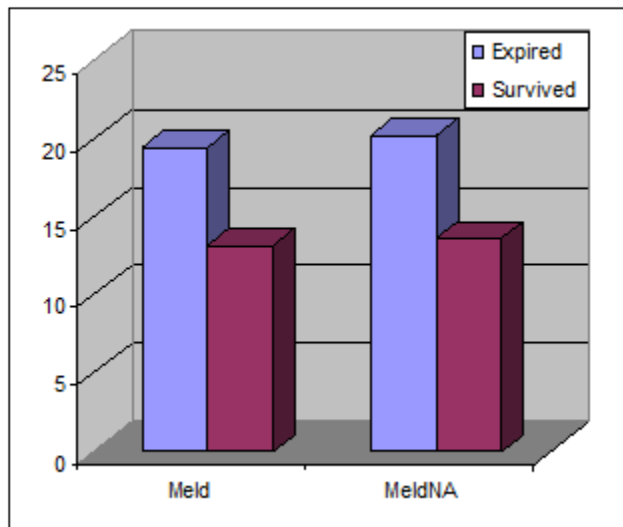
during year 2009 and 2010 were included. All the patients were assessed clinically for different complications of end stage liver disease and their blood samples sent for serum bilirubin, serum creatinine, serum sodium, coagulation profile at the time of admission. All patients were followed at 3 months interval through telephone calls .The outcome of each patient with end stage liver disease was recorded. Patients were divided into two groups according to outcome, those who survived at the end of 3 months and those who expired within or by the end of observation period (3 months).

**Prognostic models:** The level of serum creatinine, the INR for prothrombin time and the level of serum total bilirubin were recorded on admission .Serum sodium was also measured at the time of admission. The MELD and MELD Na scores were calculated according to the formula:

1. MELD score =  $11.2 * \ln(\text{INR}) + 9.57 * \ln(\text{creatinine}) + 3.78 * \ln(\text{billirubin}) + 6.43$ (an intercept)
2. MELDNa score =  $\text{MELD} - \text{Na} - [0.025 * \text{MELD} * (140 - \text{Na})]$

**Statistical analysis:** Data was analyzed in SPSS 15 and students T test was applied to find out the mean MELD and MELDNa scores in both groups. Total 300 patients were recruited, and their MELD and MELD-Na scores were calculated at the time of admission. Out of 300 at the end point of observation i.e. 3 months, 45.6% (137) patients expired and 55.6% (167) survived and 5.6% (17) patients were lost to follow up. The average age of survival group (52 females and 94 male) was 51.30 and that of dead group (64 females and 73 males) was 55.24. There was significant difference in age between the survival and the dead group (p 0.008). Majority of patients 74% (222 out of 300) had chronic liver disease due to HCV, 11.3%(34 out of 300) due to HBV, 7.3%(22 out of 300) due to alcoholism and 1.6% ( 5out of 300) had cirrhosis due to other causes. Upper GI bleed at time of admission was observed in 57% (172 patients) patients out of them 77 expired within observation period. Encephalopathy at time of admission was seen in 43.3%(130 patients) out of them 77 died. Ascites was present in38.6 %( 116 patients) at presentation, out of them 71 died in observation period. Mean serum sodium in expired group was 137.5 with standard deviation of 6.277 .in survival groups mean serum sodium was 138.86 with standard deviation of 5.627. No significant statistical difference was seen in serum sodium in expired and survival group with p value0.06. Mean MELD score in expired group was 20.1387 with standard deviation of 10.02 and in survival group was 13.8 with standard deviation of 8.959. MELD Na scores in expired and survival group were  $21.25 \pm 10.21$  and  $14.55 \pm 8.78$  respectively. There was a significant difference in MELD and MELD-Na scores between the survival and the dead groups (p 0.00). Both were higher in expired group.

Fig.1 Showing the Comparison of means of MELD & MELDNA Scores in Expired/Survived Group



Above graph elucidate very clearly that there is significant difference between the mean scores of both groups. Pearson's correlation between the MELD scores of expired/survived patients and was found to be (r=0.653, p-value=0.000) positively and significantly correlated.

Table 1: Comparison of different Parameters in expired/survived Patients

Outcome		MELD Score	MELDNa	age	S.Sodium
Expired	Mean	20.1387	21.2509	54.93	137.51
	Std. Deviation	10.02714	10.21246	12.880	6.277
Survived	Mean	13.8381	14.5556	51.21	138.86
	Std. Deviation	8.95982	8.78025	10.454	5.627
Total	Mean	16.9431	17.8551	53.04	138.19
	Std. Deviation	9.99482	10.07048	11.839	5.984
<b>P-Value</b>		<b>0.000</b>	<b>0.000</b>	<b>0.008</b>	<b>0.06</b>

Sodium is found insignificant

## DISCUSSION

Pakistan has a population of 170 million people with low health and poor educational facilities<sup>12</sup>. 10 million people are presumed to be infected with HCV in Pakistan<sup>13</sup>. 2 billion people in world are currently infected with HBV<sup>14</sup>. Chronic HBV is currently the most common cause of cirrhosis and HCC in world<sup>15</sup>. This study reviewed the prognostic value of MELD and MELD Na scores in patients with end stage liver disease due to HBV, HCV and other causes.

To predict the prognosis is of paramount importance for the clinicians<sup>3</sup>. Different predictive models are used to assess prognosis in cirrhotic patients. Among these child-Pugh Score (CTP), MELD and MELD Na are widely used. MELD score was adopted in 2002 as standard for prioritizing organ donation for liver transplantation, to predict short term mortality in these patients<sup>10</sup>. The MELD score has advantage over conventional CTP score due to readily available and objective variables (serum bilirubin, INR, and serum creatinine)<sup>3</sup>. This study, the 3 month mortality was found to be correlated with MELD scores.

The prognostic accuracy of MELD scores may be improved by addition of serum sodium, which is readily available and objective laboratory test<sup>3</sup>. As liver cirrhosis progresses, there is fall in serum sodium concentration and many of these patients develop hypervolemic hyponatremia and patients have low serum sodium with expanded extracellular volume ascites and edema<sup>8</sup>. Hyponatremia has been associated with the hepatorenal syndrome, ascites and death from liver disease<sup>10,11</sup>. This makes serum sodium an important predictor of mortality.

In this study we recruited 300 patients with end stage liver disease, and their MELD and MELDNa scores were calculated at time of recruitment. Our study showed that commonest cause of end stage liver disease in our population is cirrhosis due to hepatitis C virus next is cirrhosis due to hepatitis B virus. Majority of these patients presented with various complications due to cirrhosis such as hepatic encephalopathy, variceal bleed, ascites etc.

MELD and MELD Na scores were useful as short term predictors of mortality in these patients with end stage liver disease. Patients with higher Meld scores had higher mortality at 3 months as compared to patients with lower MELD and MELD Na scores. Mean MELD score in our study in expired group was 19.48 and mean MeldNa score in this group was 20.26. While mean MELD and MELD Na scores in survival group were 13.21 and 13.64 respectively. Serum sodium was also low in expired patients as compared to survival group with mean value of 137.51 and 139.28.

Our study also showed that age was also significant variable in predicting short term mortality in patients with end stage liver disease; with mean age 55.24 in expired group and 51.30 in survival group (p 0.005). Thus increasing age is associated with poor short term outcome in cirrhotic patients.

Hepatitis C was commonest cause of cirrhosis in our patients. so efforts should be made to reduce transmission rate of hepatitis C and also B virus and to screen the population for viral hepatitis so that suitable candidates could be treated with anti-viral therapy to reduce the incidence of end stage liver disease and cirrhosis in our population as end stage liver disease is associated with poor outcome especially in patients with higher MELD and MELD Na scores.

## CONCLUSION

Our study showed that MELD and MELD –Na scores can be used to predict the short term mortality in patients presenting with end stage liver disease or any of its complications irrespective of the etiology.

However our study failed to show serum sodium as an independent predictor of mortality in these patients. MELD and MELD-Na scores therefore should be calculated in patients with end stage liver disease to predict short term prognosis and if possible to refer patients for orthotopic liver transplantation.

## REFERENCES

1. Ali SA, Donahue R M.J. , Qureshi H and Vermund SH. Hepatitis B and Hepatitis C in Pakistan : Prevalence and risk factors. *Int.J.Infect Dis.* 2009 January ; 13(1):9-19.
2. Ho JK, Yoshida E. The Extrahepatic Consequences of Cirrhosis. *MedGenMed* 2006; 8:59.
3. Chen HA ,Chen YH , Zhao H ,Yi SH,et al. Model for end-stage liver disease –sodium predicts prognosis in patients with chronic severe hepatitis B. *Z hongua Wai Ke Za Zhi.* 2009 Dec 1 ; 47(23):1771-4.
4. UStransplant .Scientific registry of transplant recipients. Transplant program and OPO-specific reports July 2008.
5. Wiesner RH,McDiarmid SV,Kamath PS ,et al.MELD and PELD : application of survival models to liver allocation. *Liver transplant* 2001;7:567-80.
6. Freeman RB Jr,Wiesner RH, Harper A, et al.The new liver allocation system:moving toward evidence-based transplantation policy. *Liver Transpl* 2002;8:851-8.
7. Kamath PS ,Kim WR ;Advanced Liver Disease Study Group.The model for end –stage live disease(MELD). *Hepatology*-2007;45(3):797-805.
8. Cardenas A and Gines P.Predicting Mortality in Cirrhosis- Serum Sodium Helps. *NEJM MED* 2008 September ;359:1060-1062.
9. Londono M-C, Cardenas A ,Guevara M, Quinto L, Heras D , Navasa M,et al. MELD Score and serum sodium in the prediction of survival of patients with cirrhosis awaiting liver transplantation. *Gut* 2007 September 56(9):1283-1290.
10. W.Ray Kim , Scott W. Biggins, W alter K. Kremers,et al. Hyponatremia and mortality among patients on the Liver –Transplant Waitng List. *NEJM MED* 2008;359:1018-26.
11. Borroni G , Maggi A , Sangiovanni A , Cazzaniga M, Salerno F. Clinical relevance of hyponatremia for the hospital outcome of cirrhotic patients. *Dig Liver Dis* 2000; 32: 605-10.
12. Waheed Y , Shafi T , Safi SZ and Q adri I .Hepatitis C virus in Pakistan : A Systematic review of prevalence , genotypes and risk factors. *World J Gastroentrol.* 2009 December 7 ;15(45):5647-5653.
13. Hamid S, Umar M, Alam A, Siddiqui A, Qureshi H, Butt J. PSG consensus statement on management of hepatitis C virus infection--2003. *J Pak Med Assoc.* 2004;54:146–150.
14. Zuckerman JN, Zuckerman AJ. Current topics in hepatitis B. *J Infect.* 2000;41:130–136.
15. Baig S, Siddiqui AA, Ahmed W , Qureshi H and Arif A . The Association of complex Liver Disorders with HBV genotypes prevalent in Pakistan. *Virolog .J.* 2007 ; 4:128.