


Original Research Article

# Predicting the prognosis of chronic liver disease: A comparison between Child – Pugh score and Model for end stage liver disease (MELD)

S. Arun Kumar<sup>1\*</sup>, Babu Rajendran<sup>2</sup>, S.R Charu Nagarjun<sup>3</sup>, Sakthivel V<sup>4</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Assistant Professor, <sup>3</sup>Post Graduate, <sup>4</sup>Professor and Head  
Department Of General Medicine, Vinayaka Missions Medical College, Karaikal, India

\*Corresponding author email: [avsarun.kkl@gmail.com](mailto:avsarun.kkl@gmail.com)

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## Abstract

**Background:** It has been a great challenge for the physician to predict the prognosis and outcome of the chronic liver disease. Child-Pugh and MELD scores have been a widely used method for the assessment of prognosis in liver cirrhosis. Both used to determine the need for transplantation and also used to determine the effect of treatment on liver function. The combination of Child-Pugh and MELD score can guide patients and surgeons regarding operative risks.

**Aim and objective:** To study and compare the clinical outcomes of patients with liver disease as predicted by Child – Pugh Scoring system, MELD Scoring system, to evaluate the prognostic accuracy of both (Child-Pugh Scoring System and MELD Scoring System).

**Materials and methods:** The study was carried out at Vinayaka Mission's Medical College and Hospital, Karaikal among the patient population of the medicine ward who were diagnosed as having the chronic liver disease. This included 75 adult patients with the chronic liver disease who were either inpatients or those who reported for follow up as outpatients who were being managed on an ambulatory basis. All the selected patients were subjected to two scoring systems namely Child-Pugh Scoring and MELD Scoring Systems. The two scores derived from applying both the scoring system on each patient were compared and studied for predictive value and prognostic accuracy.

**Results:** In our study, Correlation between Child-Pugh Score and survival was -0.56 and correlation between MELD score and survival were -0.64. The following diagnostic indices were obtained: Child-Pugh Score: Sensitivity: 42%, Specificity: 78%. MELD Score: Sensitivity: 62%, Specificity: 87.5%. It was well observed that both scoring systems predict clinical outcome well, both scoring systems can be used to prognosticate survival in patients with Chronic Liver disease. However, it appeared that MELD Score is more accurate than the Child-Pugh score for prognostic purposes.

**Conclusion:** Pearson's Coefficient of correlation is closer to -1 for MELD Score as compared to Child-Pugh Score. MELD Score has a higher sensitivity and a higher positive predictive value as compared to Child-Pugh score. Hence MELD Score is a better and more accurate clinical scoring system for Chronic liver disease as compared to Child-Pugh score.

## Key words

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Child-Pugh Score, Chronic liver disease, MELD Scoring System, Liver cirrhosis.

## Introduction

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The liver is the largest gland in the body weighing 1-15 kg which is both a secretory and excretory organ. Diseases of the liver that progress to irreversibility are abundant in the community and are a major cause of mortality and morbidity [1]. In most cases a diagnosis of the liver disease can be made by careful history, physical examination and application of few laboratory tests. For a number of chronic liver diseases, including cirrhosis, it has been a challenging issue for physicians to elaborate reliable tools for predicting the outcome [2]. Some patients may require intensive care and therapy and may even require referrals to higher centres for more advanced modalities of treatment such as liver transplantation [3]. Taking into account the limited resources of our healthcare set up, and even fewer opportunities to provide state of the art modalities of therapy to such patients, we must prioritize the patients who have to be given access to these resources. The principal goal is to establish a single score resulting from the sum of a subset of individual variables, each being supposed to weight on the progression of the disease [4]. Although there are a few prognostic scoring systems that may achieve the above purpose, it is the Child – Pugh scoring system method which assesses the progression and outcome of liver disease [5]. But after recent studies, the focus has shifted to a newer scoring system popularly referred to as the meld system. which is more accurate in

predicting the severity of liver disease. This study we will compare the clinical outcomes as predicted by both scoring systems, and evaluate the efficacy and prognostic accuracy of the Child-Pugh scoring system and the mayo/model for end-stage liver disease (MELD) scoring system [6].

## Materials and methods

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The study was carried out at Vinayaka Mission's Medical College and Hospital, Karaikal amongst the patient population of the medicine wards who had been diagnosed as having the chronic liver disease. This study was executed on a minimum number of 75 adult patients with the chronic liver disease who were either in-patients or those who reported for follow-ups as out-patients with the chronic liver disease who were being managed on an ambulatory basis. The diagnosis of chronic liver disease was established after a thorough and detailed elicitation of clinical history and an equally precise physical examination and some select investigations (after getting consent) like: Complete hemogram, Prothrombin time (INR), Liver function tests, Serum urea and serum creatinine, Serological markers for hepatitis HBsAg, anti-HCV, Serological markers for human deficiency virus and Abdominal ultrasound.

**Inclusion criteria:** Age  $\geq$  18 years, Patients with chronic viral hepatitis, Patients with established diagnosis of cirrhosis of the liver irrespective of

etiology, Patients with cholestatic liver disease (primary biliary cirrhosis, primary sclerosing cholangitis etc.), Patients with primary metabolic disease of the liver (Glycogen storage diseases, Wilson’s disease, Alpha-1 Antitrypsin deficiency

etc.), Patients with primary malignancies of the liver (Hepatocellular carcinoma, Hepatoblastoma etc.), Patients with Budd – Chiari syndrome and non-alcoholic fatty liver diseases.

**Table – 1:** Child-Pugh score [3].

<b>1. Hepatic encephalopathy</b>	
<b>Absent</b>	1 points
<b>Grade 1 – 2</b>	2 points
<b>Grade 3 – 4</b>	3 points
<b>2. Ascites</b>	
<b>Absent</b>	1 point
<b>Slight</b>	2 points
<b>(Easily controlled by diuretics)</b>	
<b>Moderate</b>	3 points
<b>(Uncontrolled despite adequate treatment)</b>	
<b>3. Serum Albumin</b>	
<b>&gt;3.5 g/dl</b>	1 point
<b>2.8-3.5 g/dl</b>	2 points
<b>&lt;2.8 g/dl</b>	3 points
<b>4. Prothrombin time (Seconds prolonged)</b>	
<b>&lt;4 Sec</b>	1 point
<b>4-6 Sec</b>	2 points
<b>&gt;6 Sec</b>	3 points
<b>I.N.R</b>	
<b>&lt;1.7</b>	1 point
<b>1.7-2.3</b>	2 points
<b>&gt;2.3</b>	3 points
<b>5. Serum Bilirubin</b>	
<b>&lt;2 mg/dl</b>	1 point
<b>2-3 mg/dl</b>	2 points
<b>&gt;3 mg/dl</b>	3 points
<b>For primary biliary cirrhosis / primary sclerosing cholangitis or other cholestatic liver diseases:</b>	
<b>&lt;4 mg/dl</b>	1 point
<b>4-10 mg/dl</b>	2 points
<b>&gt;10 mg/dl</b>	3 points

**Exclusion criteria:** Age < 18 years, Patients with established psychiatric diseases, Patients with systemic infections, Patients with metastatic malignancies, Patients with associated primary cardiopulmonary disease, Patients who are H.I.V positive or are suffering from AIDS, Patients with head injury / trauma, Patients with acute

liver failure / fulminant hepatic failure, Patients with acute viral hepatitis, Patients with serum creatinine >4mg/dl, Patients who lost to follow up. All the selected patients will then be subjected to two scoring systems, namely. The Child-Pugh score was as per **Table – 1** [3].

Thus the Child-Pugh score varies from 5 (least sick) to 15 (most sick). It thus follows that the greater score on the Child-Pugh scoring system, greater mortality. The patients may be further classified into Child-Pugh class-A -Score of 5 – 6; B-Score of 7 – 9; C-Score  $\geq$  10. In general ‘Decompensation’ indicates a Child-Pugh score of 7 and above and this is an accepted criterion for liver transplantation.

### **The MELD Score**

$0.957 \times \text{LOGe} (\text{Creatinine in mg/dl}) + 0.378 \times \text{LOGe} (\text{Bilirubin in mg/dl}) + 1.120 \times \text{LOGg} (\text{INR}) + 0.643$ . Multiply the score by 10 and round off to the nearest whole number. Laboratory values less than 1.0 are set to 1.0 for ease of calculations. The maximum serum creatinine considered in the meld score equation is 4.0 mg/dl. If the patient has had dialysis twice within a week prior to the serum creatinine test then the meld score is calculated with a serum creatinine value, of 4.0 mg/dl. Thus the MELD system is a numerical scale ranging from 6 (less ill) to 40 or more (gravely ill). The two scores derived from applying both the scoring systems on each patient will then be compared and studied for predictive value and prognostic accuracy.

### **Results**

In our study, Correlation between CHID-PUGH Score and survival was -0.56 and correlation between MELD score and survival were -0.64. The following diagnostic indices were obtained: Child-Pugh Score: Sensitivity: 42%, Specificity: 78%. MELD Score: Sensitivity: 62%, Specificity: 87.5%. It was well observed that both scoring systems predict clinical outcome well, both scoring systems can be used to prognosticate survival in patients with Chronic Liver disease. However, it appeared that MELD Score is more accurate than the Chid-Pugh score for prognostic purposes.

### **Discussion**

Over the years, many clinical and biochemical parameters have been suggested in order to more

accurately predict the prognosis of cirrhotic patients and correctly assess their short and medium-term survival [7]. The Child-Pugh score is still considered the cornerstone in the prognostic evaluation of cirrhotic patients although it was formulated more than 30 years ago [8]. Nevertheless, it has some drawbacks such as subjectivity of clinical parameters and limited discriminant ability [9]. Child-Pugh class A patients usually show good medium-term survival without liver transplantation unless other events (for example, hepatocellular carcinoma, uncontrolled bleeding due to portal hypertension, etc.) occur. While Child-Pugh class C patients are considered the conventional candidates for the liver transplantation procedure [10]. Child-Pugh class B patients can be considered a heterogeneous group as their clinical condition may remain stable for more than a year or rapidly deteriorate [11]. While the development of the Child-Pugh classification was based on empiric assessment, many subsequent studies have shown that Child-Pugh score is predictive in the assessment of prognosis in patients with liver disease [12]. These studies demonstrated that each of the five individual clinical variables as well as the overall Child-Pugh classification had prognostic significance. The difficulties and interobserver variability for the subjective parameters in the Child-Pugh classification led to the development of the model for an end-stage liver disease (MELD) score based on laboratory values only, which should be more objective and accurate than Child-Pugh classification. Originally, the MELD score was developed for patients undergoing TIPS [TIPS-MELD score (TMS)]. It was then modified slightly to predict survival in patients with liver cirrhosis in general (MELD). MELD is a continuous function of bilirubin, the international normalized ratio (INR), and creatinine to predict short-term (three months) survival rates and was derived by Cox proportional hazards regression analysis and validated in an independent patient sample. It was validated by the same authors on a broad series of patients with liver disease of various etiology and severity. MELD appears to be reliable as a prognostic model for patients with

end-stage liver disease due to objective and readily available laboratory variables [13]. Nevertheless, although the MELD score takes into consideration objective parameters (Serum creatinine, the international normalized ratio, bilirubin levels) and is computed with statistically derived coefficients on a continuous scale with no upper or lower limits, thus avoiding many drawbacks of the Child-Pugh score, it has generated some criticism with regards to its validity in early liver disease. In our study, which lasted one year and involved 75 patients, 23 remained alive at the end of one year (31%) and 52 expired (69%). 15% belonged to class A with an observed mortality of 18%, 37% cohort belonged to class B with an observed mortality of 68%, and 48% cohort belonged to Class C with an observed mortality of 86%. Botta, Giannini, et al., in their study reported an overall mortality of 24% in their cohort as compared to 82% in our study. This low mortality may be accounted for by the execution of interventional measures such as shunt surgeries and liver transplantation which is common in the west, but virtually out of bounds in a small town in Pondicherry. They also reported an observed mortality of 12% in Child-Pugh class A patients, 16% in class B patients, and 44% in class C patients. When MELD scoring system was applied, in patients with a score of 20 or less there was an observed mortality of 47%, inpatient with a score of 21-29 there was an observed mortality of 85%, and in those with scores of 30 or more, there was an observed mortality of 100%. Malinchoc et al reported an observed mortality of 54.4% in their cohort whose scores were 20 or less, and an observed mortality of 71.5% in patients with a score greater than 20. The difference in mortality may be explained by etiological variations in the cause of death [14]. In our study, the correlation between Child-Pugh score and survival was -0.56 and the correlation between MELD score and survival were -0.64. Using a cut off of a predicted probability of death of 100% over 1 year period, in our study the following diagnostic indices were obtained for Child-Pugh score:- 1. Sensitivity = 42%, Specificity = 78%. 2. Salerno,

et al. reported (for a Child-Pugh score). 3. Sensitivity = 36% Specificity = 93.5%. 4. Angermayr, et al. reported (for a Child-Pugh score). 5. Sensitivity = 33% and Specificity = 94%. 6. Similarly the diagnostic indices for MELD score in our study were as follows: Sensitivity = 62%, Specificity = 87.5%, Salerno, et al. reported (for MELD score), Sensitivity = 45%, Specificity = 97% Angermayr Sensitivity = 34% and Specificity = 94%. Thus we see that the diagnostic indices in our study are comparable, et al. reported (for Child-Pugh score), to the other studies. From the above discussion, it is well observed that both scoring systems predict clinical outcome well, both scoring systems can be used to prognosticate survival in patients with the chronic liver disease. However, it appears that MELD score is more accurate than the Child-Pugh score for prognostic purposes [15].

## **Conclusion**

Chronic liver diseases are not only abundant in the community but are a major cause of in-hospital morbidity and mortality. They place a tremendous strain on an already overburdened setup with limited care resources. Such patients require a great deal of specialized care such as intensive care and therapy and may even require referrals to higher centers for advanced modalities of treatment like liver transplants. In our study, which lasted one year and involved 75 patients, 23 remained alive at the end of one year and 52 expired. There was an inverse correlation between Child-Pugh score and survival period and the Pearson's correlation coefficient was -0.56. The regression coefficient was -14.7. The predicted survival as per the regression equation was found to be 335- 14.7 (Child-Pugh score) +/- 38 days. An inverse correlation between MELD score and survival period and the Pearson's correlation coefficient was -0.64. The regression coefficient was -5.4 Predicted survival as per the regression equation was found to be 562- 5.4 (MELD score) +/- 22 days. Using a cut-off of a predicted probability of death of 100% over a year study period the following diagnostic indices were obtained for the Child-Pugh score.



Sensitivity = 42% Specificity = 78% .Using a cut –off of a predicted probability of death of 100% over a year study period the following diagnostic indices were obtained for MELD score. Sensitivity = 62% ,Specificity = 87.5%.Pearson’s coefficient of correlation is closer to -1 for MELD score as compared to Child-Pugh score. MELD score has a higher sensitivity and a higher positive predictive value as compared to Child-Pugh score. Thus MELD score is a better and more accurate clinical scoring system for chronic liver diseases as compared to Child-Pugh score. In the Child-Pugh score, a score of 10 and above (Class C ) indicates a grave prognosis and if aggressive intervention is not undertaken, mortality is certain. So also in the MELD score, a score of 26 and above implies a grave prognosis and mortality is certain if intervention is not undertaken. Such patients are immediate candidates for shunt surgeries and liver transplantation and other allied support such as intensive care and ventilator support.

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