

## ORIGINAL RESEARCH

# Study of cardiac profile in cirrhosis patients and its correlation with model for end stage liver disease (MELD) score

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### ABSTRACT

**Background:** This study was conducted to study cardiac profile in cirrhosis patients and its correlation with model for end stage liver disease score. **Material and methods:** Patients visiting OPD and admitted in Department of medicine, R.D.Gardi medical college and charitable hospital, Ujjain. with the diagnosis of Cirrhosis of liver, fulfilling the inclusion and exclusion criteria were included in the study group. 70 such patients were taken up for this study. Cardiac profile was evaluated. Its correlation with severity of liver cirrhosis was further assessed. **Results:** In this study, the mean age of the cases was 44.89 years. In present study mean Heart rate in Child Turcott Pugh class B =  $92.53 \pm 16.15$  and class C =  $90.40 \pm 12.68$  and found to be statistically non significant with a p value of 0.571. Heart rate did not change much with increased progression of child class severity. The present study showed a longer corrected QT interval in Page 91 Child pugh class C cirrhotic patients as compared to Child Pugh Class B. Mean PR interval in Child turcott class B =  $135.49 \pm 18.26$  and Child turcott class C =  $144.80 \pm 22.61$  found to be statistically non-significant with a p value of 0.065. In present study mean E/A ratio in Child pugh class B is  $1.19 \pm 0.52$  and Child Pugh class C is  $1.19 \pm 0.50$  found to be statistically significant with a p value of 0.034. **Conclusion:** MELD score and Child Pugh score are time tested modalities used for assessing severity of patients in liver cirrhosis.

**Keywords:** cardiac profile, cirrhosis, MELD score, liver disease.

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### INTRODUCTION

Liver cirrhosis is the development of degenerative nodules surrounded by fibrous bands in response to chronic liver injury which may be brought about by chronic alcohol intake, hepatitis B or C infection, non-alcoholic steatohepatitis or other hepatic insults which may lead to end-stage liver disease.<sup>1</sup> Cirrhotic cardiomyopathy, a rarely described complication, is defined as the presence of chronic cardiac dysfunction among patients with liver cirrhosis which is characterized by an abnormal and blunted contractile responsiveness to physiological, pathological or pharmacological stress, in the absence of known cardiac disease and irrespective of the causes of cirrhosis.<sup>2,3</sup>

The actual prevalence of cirrhotic cardiomyopathy is unknown.<sup>2</sup> Most of these patients have normal or near normal cardiac function at rest but with abnormal

cardiac responses during exertion, stress or liver transplantation.<sup>1-3</sup> The natural history of the disease has not been extensively studied yet. The condition has been described to be well tolerated with most patients being asymptomatic during the initial development of this complication.<sup>2-4</sup> Hence, this study was conducted to study cardiac profile in cirrhosis patients and its correlation with model for end stage liver disease score.

### MATERIAL AND METHODS

Patients visiting OPD and admitted in Department of medicine, R.D.Gardi medical college and charitable hospital, Ujjain. with the diagnosis of Cirrhosis of liver, fulfilling the inclusion and exclusion criteria were included in the study group. 70 such patients were taken up for this study.

**STUDY DESIGN**

A hospital based observational prospective study.

**STUDY DURATION**

This study was done over a period of one and half year

**INCLUSION CRITERIA**

1. All the patients with diagnosis of liver cirrhosis(diagnosed on the basis of clinical,biochemical and USG abdomen examination) who were hospitalized for treatment and newly diagnosed cases of cirrhosis in our hospital; irrespective of the etiology of cirrhosis.
2. All male and female > 18 years of age

**EXCLUSION CRITERIA**

1. Patient suspected of malignancy of liver
2. Patient of known h/o of cardiovascular disease

**DATA COLLECTION AND METHODS**

Data was collected in a pretested proforma from eligible patients. 70 patients were selected on the basis of simple random sampling. They were subjected to detailed history taking, clinical examination, routine laboratory and radiological investigations. Diagnosis of cirrhosis was based on clinical features and abdominal ultrasound scan. Severity of the cirrhosis was evaluated by Child-Pugh criteria and divided in three groups: A, B and C. and MELD score and divided into different MELD categories with estimated 3 month mortality.

**RESULTS**

In this study, the mean age of the cases was 44.89 years. In present study mean Heart rate in Child Turcott Pugh class B =92.53±16.15 and class

C=90.40±12.68 and found to be statistically non significant with a p value of 0.571.Heart rate did not change much with increased progression of child class severity. Mean RR interval in Child turcotte class B =648.47±125.47 and Child turcott class C =672.32±105.91 found to be statistically non significant with a p value of 0.424. Mean PR interval in Child turcott class B=135.49±18.26 and Child turcott class C =144.80±22.61found to be statistically non significant with a p value of 0.065. Mean QRS duration in Child turcott class B=54.76±14.32 and Child turcott class C =56.20±12.69 found to be statistically non significant with a p value of 0.675. Mean Qtc duration in Child turcott class B=438.44 ±25.31 and Child turcott class C =453.20±20.36.found to be statistically significant with a p value of 0.015 . The present study showed a longer corrected QT interval in Page 91 Child pugh class C cirrhotic patients as compared to Child Pugh Class B. Mean PR interval in Child turcott class B=135.49±18.26 and Child turcott class C =144.80±22.61found to be statistically non-significant with a p value of 0.065. Mean QRS duration in Child turcott class B=54.76±14.32 and Child turcott class C =56.20±12.69 found to be statistically non significant with a p value of 0.675. Mean Qtc duration in Child turcott class B=438.44 ±25.31 and Child turcott class C =453.20±20.36.found to be statistically significant with a p value of 0.015. 13 patients in child class B(44.8%) and 16 patients(55.2%) in child class C had low voltage Ecg findings and about half of the patients 29/70 patients had low voltage ecg findings in either in the precordial and limb leads found to statistically significant with a p value of 0.004. In present study mean E/A ratio in Child pugh class B is 1.19±0.52 and Child Pugh class C is 1.19±0.50 found to be statistically significant with a p value of 0.034.

**Table1:ComparisonofmeanheartratebetweenChild-PughClass**

Child-PughClass	N	MeanHEARTRATE	SD	t	p
C	25	90.40	12.68	-.570	
B	45	92.53	16.15		.571

**Table 2: ComparisonofmeanRRinterval betweenMELDcategory**

MELDCategory	N	MeanRRINTERVAL	Std.Deviation	F	P
<= 9	11	599.45	132.74	2.068	.113
10–19	44	666.57	110.97		
20–29	8	622.75	122.52		
30–39	7	726.29	113.11		
Total	70	656.99	118.63		

**Table 3: ComparisonofmeanPRintervalbetweenChild-PughClass**

Child-PughClass	N	MeanPRINTERVAL	SD	t	P
C	25	144.80	22.61	1.875	.065
B	45	135.49	18.26		

**Table 4: Comparison of mean PR interval between MELD category**

MELD Category	N	Mean PR INTERVAL	Std.Deviation	F	P
<= 9	11	123.45	22.00	6.520	.001
10- 19	44	137.34	18.11		
20- 29	8	151.50	15.63		
30- 39	7	157.71	14.16		
Total	70	138.81	20.27		

**Table 5: Comparison of mean QRS duration between Child-Pugh Class**

Child-	N	Mean QRS DURATION	SD	t	p
C	25	56.20	12.69	.421	.675
B	45	54.76	14.32		

**Table 6: Comparison of mean QRS duration between MELD category**

MELD Category	N	Mean QRS DURATION	Std.Deviation	F	p
<= 9	11	54.55	15.72	.243	.866
10-19	44	56.11	14.48		
20-29	8	55.00	9.26		
30-39	7	51.43	10.69		
Total	70	55.27	13.68		

**Table 7: Comparison of mean QTc duration between Child-Pugh Class**

Child-Pugh Class	N	Mean QTc	SD	t	P
C	25	453.20	20.36	2.498	.015
B	45	438.44	25.31		

**Table 8: Comparison of mean QTc duration between MELD category**

MELD Category	N	Mean QTc	Std.Deviation	F	P
<= 9	11	427.27	19.02	3.312	.025
10-19	44	443.64	26.16		
20-29	8	452.50	14.88		
30-39	7	460.00	16.33		
Total	70	443.71	24.56		

**Table 9: Comparison of mean LVEF between Child-Pugh Class**

Child Pugh Class	N	Mean LVEF	SD	t	p
C	25	60.48	2.86	0.964	0.339
B	45	61.18	2.93		

**Table 10: Comparison of mean LVEF between MELD category**

MELD Category	N	Mean LVEF	Std.Deviation	F	p
<= 9	11	61.45	2.84	0.636	0.594
10-19	44	60.66	2.99		
20-29	8	62.00	2.33		
30-39	7	60.57	3.21		
Total	70	60.93	2.90		

**Table 11: Diastolic dysfunction among different Child Pugh class**

Diastolic dysfunction	Child-Pugh Class		Total
	B	C	
Normal	27	4	31
	60.0%	16.0%	44.3%
Grade I	8	5	13
	17.8%	20.0%	18.6%
Grade II	5	10	15
	11.1%	40.0%	21.4%
Grade III	5	6	11
	11.1%	24.0%	15.7%
Total	45	25	70
	100.0%	100.0%	100.0%

Chi-Square=15.02, p =0.002

**Table 12: Diastolic dysfunction among different MELD categories**

Diastolic dysfunction	MELD SCORE				Total
	<= 9	10-19	20-29	30-39	
Normal	6	22	2	1	31
	54.5%	50.0%	25.0%	14.3%	44.3%
Grade I	4	9	0	0	13
	36.4%	20.5%	0.0%	0.0%	18.6%
Grade II	1	7	4	3	15
	9.1%	15.9%	50.0%	42.9%	21.4%
Grade III	0	6	2	3	11
	0.0%	13.6%	25.0%	42.9%	15.7%
Total	11	44	8	7	70
	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square=18.95, p=0.02

**DISCUSSION**

Chronic liver disease (CLD) is defined as a disease of the liver resulting from an inflammatory, infiltrative, immunologic, circulatory, or metabolic injury to the liver which has been ongoing for 6 months or longer. It can also be defined as the destruction of the liver parenchyma leading to fibrosis and cirrhosis which has lasted more than 6 months. It is an asymptomatic progressive disease and is mostly fatal with five-year survival rates exhibiting a range from complete mortality to a maximum of 80%.<sup>4,6</sup>

Chronic hepatitis B and C virus infections and chronic alcohol consumption are the most common etiologies of CLD; other causes include: non-alcoholic steatohepatitis (NASH), autoimmune hepatitis, primary biliary cirrhosis, primary sclerosing cholangitis, Wilson disease, hemochromatosis and alpha-1-antitrypsin deficiency; smoking, obesity, and diabetes mellitus are predisposing factors for CLD.<sup>7</sup> Chronic liver disease is the fifth leading cause of mortality globally and the third most common cause of death in the medical wards.<sup>8,9</sup>

Significant hepatic dysfunction is reported in several studies as being frequently found in patients with advanced HF, and may manifest as congestive hepatopathy and cardiac cirrhosis, or in other ways. Hepatic function markers (aspartate aminotransferase, alanine aminotransferase, bilirubin, alkaline phosphatase, etc.), although showing significant improvement after a few months of heart transplantation, were also related to unsatisfactory results, since the reversibility in this case will depend on the degree of hepatic parenchyma impairment.<sup>10,11</sup> Hence, this study was conducted to study cardiac profile in cirrhosis patients

and its correlation with model for end-stage liver disease score. In this study, the mean age of the cases was 44.89 years. In present study mean Heart rate in Child Turcott Pugh class B = 92.53 ± 16.15 and class C = 90.40 ± 12.68 and found to be statistically non significant with a p value of 0.571. Heart rate did not change much with increased progression of child class severity. Mean RR interval in Child turcotte class B = 648.47 ± 125.47 and Child turcott class C

= 672.32 ± 105.91 found to be statistically non significant with a p value of 0.424. Mean PR interval in Child turcott class B = 135.49 ± 18.26 and Child turcott class C = 144.80 ± 22.61 found to be statistically non significant with a p value of 0.065. Mean QRS duration in Child turcott class B = 54.76 ± 14.32 and Child turcott class C = 56.20 ± 12.69 found to be statistically non significant with a p value of 0.675. Mean Qtc duration in Child turcott class B = 438.44 ± 25.31 and Child turcott class C = 453.20 ± 20.36 found to be statistically significant with a p value of 0.015. The study conducted by Moraes ACO et al<sup>12</sup> aimed to analyze the knowledge on MELD score and its derivatives to the prognosis of patients with end-stage heart failure considered for heart transplantation. There was carried out an integrative review of the publications of the last ten years in Pubmed and Lilacs databases, using the descriptors "heart transplantation", "liver disease" and "prognosis". From the total of 111 articles found, six were selected and composed the sample. The MELD-XI score (excluding INR) was the most analyzed in the studies due to the exclusion of INR, since many patients with heart failure use anticoagulants, which may alter their value. MELD and derivatives were associated with unsatisfactory results in cardiac transplantation. It was concluded that the MELD score can be considered as a good predictor for heart transplantation; however, there are still few studies that make this correlation.

The present study showed a longer corrected QT interval in Page 91 Child pugh class C cirrhotic patients as compared to Child Pugh Class B. Mean PR interval in Child turcott class B = 135.49 ± 18.26 and Child turcott class C = 144.80 ± 22.61 found to be statistically non-significant with a p value of 0.065. Mean QRS duration in Child turcott class B = 54.76 ± 14.32 and Child turcott class C = 56.20 ± 12.69 found to be statistically non significant with a p value of 0.675. Mean Qtc duration in Child turcott class B = 438.44 ± 25.31 and Child turcott class C = 453.20 ± 20.36 found to be statistically significant with a p value of 0.015. 13 patients in child class B (44.8%) and 16 patients (55.2%) in child class C had

low voltage Ecg findings and about half of the patients 29/70 patients had low voltage ecg findings in either in the precordial and limb leads found to statistically significant with a p value of 0.004. In present study mean E/A ratio in Child pugh class B is  $1.19 \pm 0.52$  and Child Pugh class C is  $1.19 \pm 0.50$  found to be statistically significant with a p value of 0.034. The study conducted by Yap EML et al<sup>13</sup> aimed to describe the electrocardiographic and echocardiographic findings of Filipino patients with liver cirrhosis. A retrospective analytical study of 148 patients with liver cirrhosis from 2007 to 2016 at the Philippine Heart Center was done. The clinical characteristics, median QTc interval, systolic and diastolic functions on echocardiography of these patients were described. Spearman rho correlation was employed to determine the rank order correlation between QTc prolongation and the severity of liver cirrhosis. Fisher's Exact test was used to test the association of the echocardiographic parameters with the severity of liver cirrhosis. The 10-year prevalence rate of liver cirrhosis at the Philippine Heart Center was 0.001% (148/137,584). The mean age was  $72.4 \pm 14$  years with a female/male ratio of 1.1:1. The most common etiology of cirrhosis was hepatitis B or C infection (20%, 29). The Child-Pugh Classification (CPC) and Model for End-Stage Liver Disease (MELD) score were used to determine the severity of liver cirrhosis and to assess their prognosis. There were 31 patients (24%) with CPC-A, 84 patients (64%) with CPC-B and 15 patients (11%) with CPC-C. Fifty-five percent (n = 69) had a MELD score of 16 and below. Prolongation of the QTc interval was only seen among those with CPC A (median QTc of 470 ms) and a MELD score of 9 and below (median QTc of 485 ms). The mean left ventricular ejection fraction was  $54.40 \pm 28.63\%$ . There were five patients with a left ventricular ejection fraction of < 55%. The mean cardiac output ( $6.04 \pm 5.24$  L/min/m<sup>2</sup>) and cardiac index ( $2.92 \pm 1.47$  L/min/m<sup>2</sup>) were normal. There were 44 patients who had evidence of diastolic dysfunction based on an E/A ratio < 1, prolongation of isovolumic relaxation time (IVRT) of > 80 ms and prolongation of deceleration time (DT) of > 200 ms. There were only five patients who fulfilled the criteria for cirrhotic cardiomyopathy. A majority of the patients were discharged improved (82%). There were 26 cases who expired (18%). A higher mean age of Filipinos with liver cirrhosis was reported in this study. Prolongation of the QTc interval was seen among those with early and late stage of cirrhosis (CPC A or MELD score  $\leq 9$  and CPC C). Most of these patients had normal left ventricular systolic function precluding the presence of cirrhotic cardiomyopathy.

## CONCLUSION

MELD score and Child Pugh score are time tested modalities used for assessing severity of patients in liver cirrhosis.

## REFERENCES

- Schuppan D, Afdhal NH. Liver cirrhosis. *Lancet*. 2008;371(9615):838–851.
- Zardi EM, Abbate A, Zardi DM, Dobrina A, Margiotta D, Van Tassell BW, Afeltra A. et al. Cirrhotic cardiomyopathy. *J Am Coll Cardiol*. 2010;56(7):539–549.
- Ripoll C, Catalina MV, Yotti R, Olmedilla L, Perez-Pena J, Lo Iacono O, Rincon D. et al. Cardiac dysfunction during liver transplantation: incidence and preoperative predictors. *Transplantation*. 2008;85(12):1766–1772.
- Assessment of the sexual functions of males with chronic liver disease in South West Nigeria. Adekanle O, Ndububa DA, Orji EO, Ijarotimi O. *Ann Afr Med*. 2014;13:81–86.
- Prevalence of chronic liver diseases caused by HBV and HCV in Nigeria in comparison with European countries. Maisanda BW, Manfred M. *Med Rep Case Studies*. 2018;3:1–7.
- The prognosis and outcome of alcoholic liver disease. Morgan MY. *Alcohol Suppl*. 1994;2:335–343.
- Liver cirrhosis: epidemiology and etiology. Fehér J, Lengyel G. [http://www.researchgate.net/publication/289960324\\_Liver\\_cirrhosis\\_Epidemiology\\_and\\_etiology](http://www.researchgate.net/publication/289960324_Liver_cirrhosis_Epidemiology_and_etiology) *Orv Hetil*. 2006;147:1589–1593.
- Acute-on-chronic and decompensated chronic liver failure. Olson JC. <http://www.ncbi.nlm.nih.gov/pubmed>. *Crit Care Clin*. 2016;32:301–309.
- The burden of viral hepatitis in Africa. Bojuwoye BJ. <http://pubmed.ncbi.nlm.nih.gov/9473953/> *West Afr J Med*. 1997;16:198–203.
- Chokshi A, Cheema FH, Schaeffle KJ, Jiang J, Collado E, Shahzad K. Hepatic dysfunction and survival after orthotopic heart transplantations Application of the MELD scoring system for outcome prediction. *J Heart Lung Transplant*. 2012;31(6):591–600.
- Dichtl W, Vogel W, Dunst KM, Grander W, Alber HF, Frick M, et al. Cardiac hepatopathy before and after heart transplantation. *Transpl Int*. 2005;18(6):697–702.
- Moraes ACO, Fonseca-Neto OCLD. THE USE OF MELD SCORE (MODEL FOR END-STAGE LIVER DISEASE) AND DERIVATIVES IN CARDIAC TRANSPLANTATION. *Arq Bras Cir Dig*. 2018;31(2):e1370.
- Yap EML, Supe MGS, Yu II. Cardiac Profile of Filipino Patients With Liver Cirrhosis: A 10-Year Study. *Cardiol Res*. 2018 Dec;9(6):358-363.