The Egyptian Journal of Hospital Medicine (October 2018) Vol. 73 (8), Page 7358-7364

Evaluation of ALBI, MELD and Child-Pugh Scores as non-Invasive Predictors of Esophageal Varices

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ABSTRACT

Background: the prevalence of esophageal varices (OV) in newly diagnosed cirrhotic patients is approximately 60-80% and the 1-year rate of first variceal bleeding is approximately 5% for small esophageal varices & 15% for large esophageal varices. Non invasiveness has become a major goal in hepatology in the latter years, several serum markers and imaging methods have been tried for the non invasive assessment of portal hypertension or presence of esophageal varices. **Aim of the work:** this study aimed to compare ALBI, MELD and Child-pugh scores in prediction of esophageal varices and for discrimination between risky and non risky esophageal varices. **Methods:** in this Prospective study evaluation of of ALBI, MELD And Child-Pugh Scores As non-Invasive Predictors of Esophageal Varices was done in 80 patients with liver cirrhosis. They were divided into 2 groups, Group I: included 60 patients with liver cirrhosis & esophageal varices diagnosed by upper GIT endoscopy and will be divided into 3 subgroups 20 patients each as described below: Small, Moderate and Large esophageal varices. Group II: included 20 patients with liver cirrhosis with no esophageal varices as the control groupg. **Results:** the current study showed that ALBI score could be used as a non invasive predictor of esophageal varices with a cut-off value > - 2.2, with 96.7% sensitivity, 100% specificity, Child score could be used with a cut-off value > 5.5, with 93.3% sensitivity, 100% specificity, and MELD score could be used with a cut-off value > 8.5, with 90% sensitivity, 95% specificity. **Conclusion:** ALBI score is more accurate than Child and MELD scores as non invasive predictor of esophageal varices and its grading.

Keywords: ALBI score, Child-Pugh score, MELD score, Esophageal varices.

INTRODUCTION

The formation of esophageal varices depends on an elevation in portal pressure; a hepatic venous pressure gradient (HVPG) greater than 10 mmHg is necessary for the development of bleeding from esophageal varices [1]. The actual recommendation for surveillance in patients with compensated liver disease & small varices at the screening endoscopy is a follow-up examination after 1-2 years [2].The prevalence of esophageal varices (OV) in newly diagnosed cirrhotic patients is approximately 60-80% and the 1-year rate of first variceal bleeding is approximately 5% for small esophageal varices and 15% for large esophageal varices [3].Recently, the albumin-bilirubin (ALBI) score has been established as a more convenient and evidence-based model to assess the severity of liver dysfunction in patients with hepatocellular carcinoma (HCC) [4].

The major advantage is that the prognostic value is comparable between the ALBI and Child-Pugh scores, but two subjective variables [i.e., ascites and hepatic encephalopathy [HE] included in the Child-Pugh score are excluded from the ALBI score. The benefit of the ALBI score for assessing liver function has also been confirmed in advanced HCC patients treated with sorafenib [5].Child–Pugh score was firstly proposed by Child and Turcotte to predict the operative risk in patients undergoing portosystemic shunt surgery for variceal bleeding. It was modified by adding prothrombin time or international normalized ratio (INR) and removing nutritional status. Child–Pugh score has been widely used to assess the severity of liver dysfunction in clinical work [6]. Model for end stage liver disease (MELD) has been a useful tool to predict mortality for patients awaiting liver transplantation. However, the role of the score in predicting complications after liver transplantation has yet to be evaluated [7].

AIM of the WORK

This study aimed to compare ALBI, MELD and Child-pugh scores in prediction of esophageal varices and to use the interactive data of these scores to grade esophageal varices based upon EGD procedure as a Gold Standard.

PATIENTS and METHODS

This study was conducted in the period between Sept 2017 and June 2018. Cases were selected from Gastrointestinal Endoscopy Unit, Faculty of Medicine, Al Azhar University and enrolled in 80 patients with liver cirrhosis. They were divided into 2 groups. **Group I**: included 60 patients with liver cirrhosis and esophageal varices diagnosed by upper GIT endoscopy and they were divided into 3 subgroups 20 patients each as the following: small, moderate and large esophageal varices. **Group II**: included 20 patients with liver cirrhosis with no esophageal varices as the **control group**.

Received:27/8/2018
Accepted:17/9/2018

RESULTS

This study included 80 cirrhotic patients who were divided into two groups, **group I** was divided into 3 subgroups, in **group IA** (small esophageal varices) the mean age of the patients was 48.8 years; males predominance was 70%, while females were 30% of the studied group, in **group IB** (moderate esophageal varices) the mean age was 48.5, males were predominant by 90%, while females were 10% of the studied group, in **group IC** (large esophageal varices) the mean age of patients was 48.9 years, males were predominant by 80%, while females were 20% of the studied group and in group II (cirrhotic with no varices) the mean age of patients was 47.8 years, males were predominant by 65% while females were 35% of the studied group.The mean of ALBI score in **group IA** was - 1.9, in **group IB** it was - 1.4, in **group IC** it was - 0.5 and **in group II** it was - 2.5. The mean of Child score in **group IA** it was 6.1, in **group IB** it was 7.8, in **group IC** it was 10.6, in **group II** it was 5. The mean of MELD score in **group IA** was 12.4, in **group IB** it was 12.3, in **group IC**it was 18.7 and in **group II** it was 7.2. Using ROC curve, that ALBI score could be used as a non invasive predictor of esophageal varices with a cut-off value > - 2.2 with 96.7% sensitivity, 100% specificity, 100% PPV and 96.8% NPV, Child score could be used as a non invasive predictor of esophageal varices with a cut-off value > 5.5, with 93.3% sensitivity, 100% specificity, 100% PPV and 93.7% NPV, and MELD score could be used as a non invasive predictor of esophageal varices with a cut-off value > 8.5, with 90% sensitivity, 95% specificity, 94.7% PPV and 90.5% NPV.This study showed that ALBI score could be used to discriminate between risky and non risky esophageal varices (OVs) at a cutoff level of > - 1.04, with 100% sensitivity, 95% specificity, 95.2% PPV and 100% NPV, child score can be used to discriminate between risky and non risky OVs at a cutoff level of > 8.5, with 95% sensitivity, 80% specificity, 82.6% PPV and 94.1% NPV, and MELD score could be used to discriminate between risky and non risky OVs at a cutoff level of > 13.5, with 85% sensitivity, 62.5% specificity, 69.4% PPV and 80.6% NPV.

Table 1: demographic features of the studied groups

Groups / Variables		I A (N = 20)	I B (N = 20)	I C (N = 20)	Control (N= 20)	p-value
Age (years)	Mean	48.8	48.5	48.9	47.8	0.6
	±SD	3.01	3.5	3.5	3.01	
Gender	Male	14(70%)	18(90%)	16(80%)	13(65%)	0.2
	Female	6(30%)	2(10%)	4(20%)	7(35%)	

Table 2: comparison between the studied groups as regard laboratory data (CBC, liver functions and creatinine)

Groups / Variables		I A (N = 20)	I B (N = 20)	I C (N = 20)	Control (N= 20)	p-value
Hb (g/dl)	Mean	11.7	10.1	9.3	12.8	**< 0.001****
	±SD	± 0.7	± 0.8	± 0.6	± 0.7	
WBCs (10^3/ul)	Mean	6.5	7.4	7.2	7.8	**0.05***
	±SD	± 1.4	± 1.7	± 1.5	± 1.6	
PLT (10^3/ul)	Mean	122.5	91.2	68.5	209.7	**< 0.001****
	±SD	± 29.8	± 9.4	± 8.6	± 40.9	
AST (U/L)	Mean	28.7	56.2	69.8	24.7	**< 0.001****
	±SD	± 7.7	± 27.5	± 12.1	± 4.6	
ALT (U/L)	Mean	23.6	35.05	41.8	23.2	**< 0.001****
	±SD	± 5.6	± 9.8	± 9.6	± 5.3	
ALB (g/dl)	Mean	3.2	2.9	2.1	3.9	**< 0.001****
	±SD	± 0.2	± 0.3	± 0.2	± 0.2	
Bil. (mg/dl)	Mean	1.1	1.6	4.6	1.02	**< 0.001****
	±SD	± 0.2	± 0.3	± 1.9	± 0.1	
INR	Mean	1.2	1.4	1.4	1.04	**< 0.001****
	±SD	± 0.1	± 0.3	± 0.2	± 0.1	
Creat (mg/dl)	Mean	1.3	1.2	1.3	1.2	0.4
	±SD	0.5	0.3	0.4	0.4	

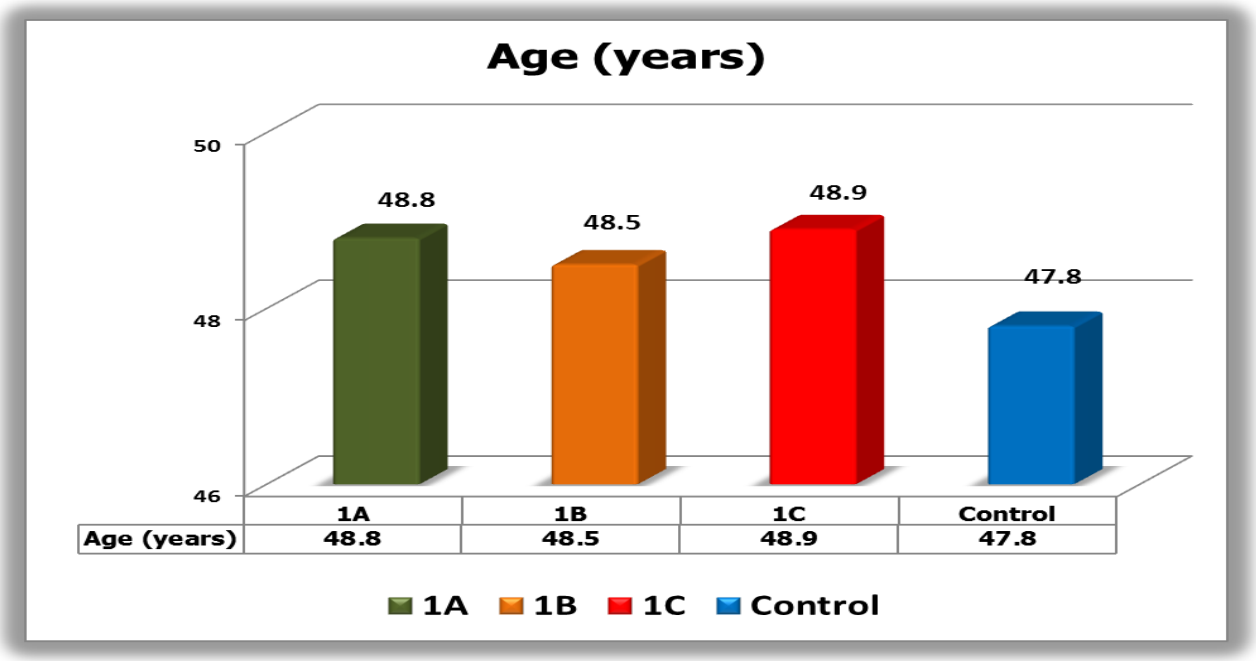

Figure 1: relation between age in the studied groups

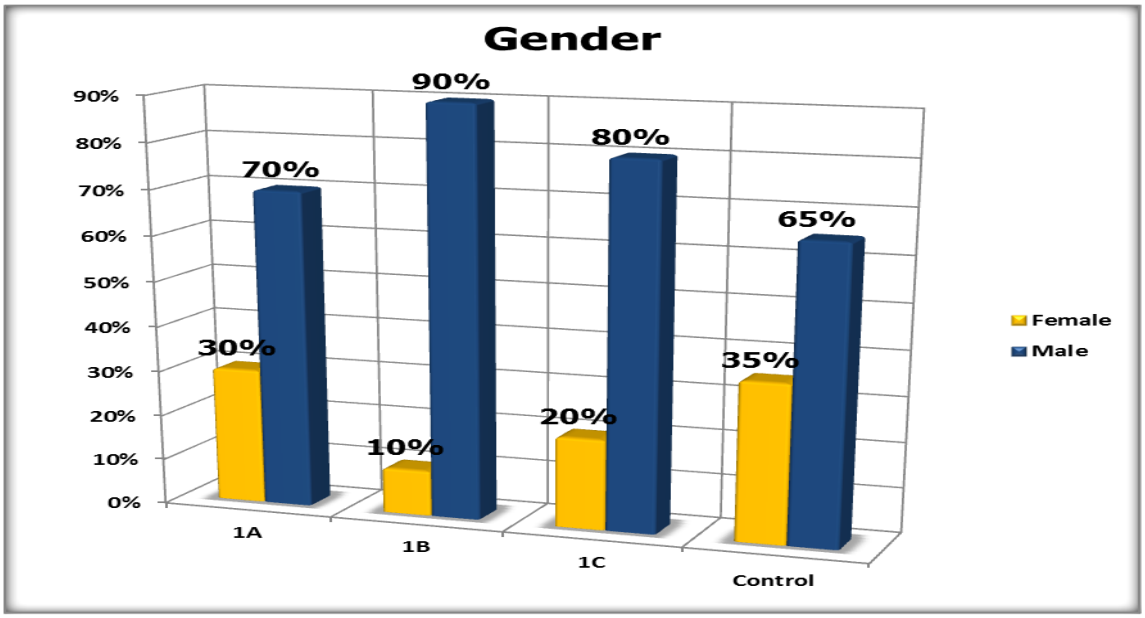

Figure 2: comparison between the studied groups as regard gender

Table 3: comparison between the studied groups as regard MELD score, Child score and ALBI score

Groups / Variables		I A (N = 20)	I B (N = 20)	I C (N = 20)	Control (N= 20)	p-value
MELD	Mean	12.4	12.3	18.7	7.2	< 0.001*
	±SD	± 4.4	± 3.2	± 5.1	± 0.9	
CHILD	Mean	6.1	7.8	10.6	5	< 0.001*
	±SD	± 0.8	± 1.7	± 0.9	± 0.0	
ALBI	Mean	- 1.9	- 1.4	- 0.5	- 2.5	< 0.001*
	±SD	± 0.2	± 0.3	± 0.2	± 0.2	

Table 4: diagnostic performance of MELD score in discrimination of patient's group and the control group

Cut off	Area under the curve	Sensitivity	Specificity	PPV	NPV	p-value
> 8.5	0.9	90 %	95 %	94.7 %	90.5 %	< 0.001

NPV: negative predictive value. PPV: positive predictive value.

Table 5: diagnostic performance of Child score in discrimination of patients group and control group

Cut off	Area under the curve	Sensitivity	Specificity	PPV	NPV	p-value
> 5.5	0.9	93.3 %	100 %	100 %	93.7 %	< 0.001

NPV: negative predictive value. PPV: positive predictive value.

Table 6: diagnostic performance of ALBI score in discrimination of patients group and control group

Cut off	Area under the curve	Sensitivity	Specificity	PPV	NPV	p-value
> - 2.2	0.9	96.7 %	100 %	100 %	96.8 %	< 0.001

NPV: negative predictive value. PPV: positive predictive value.

DISCUSSION

The development of oesophageal varices is the most common complication that can occur in liver cirrhosis. Variceal bleeding linked to portal hypertension in the patients with cirrhosis is responsible for a high mortality rate at 6 weeks (20%); therefore endoscopic screening for oesophageal varices at the time of diagnosis is extremely important and is strongly recommended by all clinical guidelines because the initiation of treatment with non cardio selective β- blockers enables a 50% reduction in the incidence of the first hemorrhage [3].

Non invasiveness has become a major goal in hepatology in the latter years, since several serum markers and imaging methods have been demonstrated to correlate well with fibrosis stage and tend to replace liver biopsy, and there is a close relationship between liver fibrosis, portal hypertension and oesophageal varices, several of these methods have been tried for the non invasive assessment of portal hypertension or presence of oesophageal varices [8].

The non invasive approach for prediction of oesophageal varices may identify those patients who can benefit from non selective beta- blockers therapy or should start endoscopic prophylaxis.

Endoscopy, however, is an invasive technique that is not easily accepted by the patients [9]. Model for end stage liver disease (MELD) has been a useful tool to predict mortality for patients awaiting liver transplantation. However, the role of the score in predicting complications after liver transplantation has yet to be evaluated [7].MELD score was better predictive factor of early mortality after resection for patients with hepatocellular carcinoma (HCC) and cirrhotic liver than Child Paugh (CTP) score irrespective of etiology of cirrhosis [10]. Recently, various modifications of the MELD have been introduced and improved accuracy in both, chronic liver failure and acute liver failure[11]. Child–Pugh score was firstly proposed by Child and turcotte to predict the operative risk in patients undergoing portosystemic shunt surgery for variceal bleeding. It was modified by adding prothrombin time or international normalized ratio (INR) and removing nutritional status. Child–Pugh score has been widely used to assess the severity of liver dysfunction in clinical work. [6]. Recently, the albumin-bilirubin (ALBI) score has been established as a more convenient and evidence-based model to assess the severity of liver dysfunction in patients with hepatocellular carcinoma (HCC) [4].

The major advantage is that the prognostic value is comparable between the ALBI and Child-Pugh scores, but two subjective variables [i.e., ascites and hepatic encephalopathy [HE] included in the Child-Pugh score are excluded from the ALBI score. The benefit of the ALBI score for assessing liver function has also been confirmed in advanced HCC patients treated with sorafenib [5]. In this study the aim was to evaluate of ALBI, MELD and Child-Pugh scores as non-invasive predictors of esophageal varices in patients with liver cirrhosis.

The current study assessed different clinical, laboratory, ultrasonographic parameters, ALBI, MELD and Child-Pugh scores as a non invasive method for diagnosis and grading of esophageal varices in (80) patients with liver cirrhosis.In this study there was no significant statistical difference between groups as regard age and gender. In our study we found a significant statistical decrease in albumin between patient groups and control group. In accordance to our results **Kazemi and his colleagues** [12] reported that serum albumin was lower in patients with esophageal varices than patients without varices and also lower in patients with large esophageal varices than patients with small esophageal varices and there was statistically significant difference. **Schepis and his colleagues** [13] **and Madhotra and his colleagues** [14] agreed with our results, They stated that low serum albumin level correlated with the presence of varices. In the present study, Platelet count was significantly statistically decreasd between patient groups and control group. That was stated by **Ismail and his colleagues** [15] and **Sen and his colleagues** [16] who found that platelet count was statistically significantly lower in patients with large varices compared to patients with small varices. Our results are also in agreement with the results reported by **Kazemi *et al.*** [13] and **Esmat *et al.*** [17]**.** Also, **Burton *et al.*** [18] found that low platelets and advanced child-pugh class are predictors of large varices. Also this was agreed by **Eslam *et al.*** [19] who found that the presence of esophageal varices was independently associated with lower platelet count, Also **Fattah *et al.*** [20] found that platelet count was lowest in patients with varices, platelet count decreases with the increase of grading of esophageal varices.

Cherian *et al.* [21] found that the presence and higher grades of varices can be predicted by a low platelet count. This may be considered as non-endoscopic predictor for the diagnosis and management of large grade varices, which was agreed with our results. In the current study, significant increase was observed as regard the mean values of liver enzymes, serum bilirubin and INR between patient groups and control group.

This was agreed with the study of **Khairy *et al.*** [22] who found that aspartate aminotransferase, was significant independent predictor of fibrosis and its complications.In this study we found a highly significant statistical increase in ALBI, MELD and Child-pugh scores in patient groups compared to control group. Also it showed the positive correlation between MELD score and grades of oesophageal varices This was agreed by the study of **Soga *et al.*** [23], who found that The Child-Pugh and MELD scores were significantly higher for patients with gastric variceal bleeding than for those receiving preventive treatment. This is in agreement with the study of **Benedeto-Stojanov *et al.*** [24] who found that The MELD score was significantly higher in the group of patients who died due to esophageal variceal bleeding and concluded that in cirrhotic patients the MELD score is an excellent survival predictor at least as well as the Child-Pugh score, Increase in the MELD score is associated with decrease in residual liver function. In the group of patients with liver cirrhosis and esophageal variceal bleeding, the MELD score identifies those with a higher intrahospital mortality risk. Also in agreement with our results.

Fattah *et al.* [20] found that MELD score proved to be sensitive and specific in differentiation between patients with and without varices. The increased MELD score was correlated with increased grade of varices. In the present study there was a highly significant statistical increase in Child score and the Child class between grades of esophageal varices ,this is in agreement with results of **Madhotra *et al.*** [14] who found a significant relation between the presence of varices and increased Child score. Also this was agreed by the study done by **Cherian *et al.*** [21] who found that the presence and higher grades of varices can be predicted by a Child-Pugh class B/C and spleen diameter.In our study, there was a highly significant statistical difference between ALBI, MELD, Child-pugh scores and ultrasound findings in patient groups as regard splenomegaly and ascites. Also there was no significant difference regarding hepatic focal lesions.

This agrees with results of **Ashraf** [25] who report that splenomegaly alone was a significant predictor for the development of large esophageal varices. Also, **Sharma *et al.*** [26] in A prospective study showed that splenomegaly was the independent predictor for the presence of large varices.

Lahmidani *et al.* [27] found that importance of ascites was correlated with the presence of large varices. **Thomopoulos *et al.*** [28] found that splenomegaly and ascites are independent predictors of large oesophageal varices in cirrhotic patients, suggested that endoscopy could be avoided safely in cirrhotic patients with none of these predictive factors, as large varices are absent in this group of patients.

Cherian *et al.* [21] found that the presence and higher grades of varices can be predicted by spleen diameter. This may be considered as non-endoscopic predictor for the diagnosis and management of large grade varices, which was agreed with our results.

Also, in agreement with our results **Chang *et al.*** [29] stated that patients who have at least two among ascites, splenomegaly, and alcoholism would have an increased risk of having large esophageal

varices.

CONCLUSION

From this study it was concluded that ALBI score could be used as a non invasive predictor of esophageal varices with a cut-off value > - 2.2, with 96.7% sensitivity, 100% specificity, 100% PPV and 96.8% NPV, Child score could be used as a non invasive predictor of esophageal varices with a cut-off value > 5.5, with 93.3% sensitivity, 100% specificity, 100% PPV and 93.7% NPV, and MELD score could be used as a non invasive predictor of esophageal varices with a cut-off value > 8.5, with 90% sensitivity, 95% specificity, 94.7% PPV and 90.5% NPV. The study also showed that ALBI score could be used to discriminate between risky and non risky esophageal varices (OVs) at a cutoff level of > - 1.04, with 100% sensitivity, 95% specificity, 95.2% PPV and 100% NPV, Child score could be used to discriminate between risky and non risky OVs at a cutoff level of > 8.5, with 95% sensitivity, 80% specificity, 82.6% PPV and 94.1% NPV, and MELD score could be used to discriminate between risky and non risky OVs at a cutoff level of > 13.5, with 85% sensitivity, 62.5% specificity, 69.4% PPV and 80.6% NPV.

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