Child-Pugh Score as a Predictor of Esophageal Varices in Liver Cirrhosis

Ahmad R[1], Hasan FMM[2], Habib A[3], Bithi KF[4], Gomes RR[5]*, Islam S[6]

[1]Resident, Neurology, National Institute of Neurosciences and Hospital, Bangladesh

[2]Associate Professor, Ad din Sakina Women's Medical College, Bangladesh

[3]Registrar, Neurology, Rajshahi Medical College Hospital, Bangladesh

[4]Junior Consultant, Medicine, National Institute of Neurosciences and Hospital, Bangladesh

[5]Professor, Medicine, Ad din Women's Medical College Hospital, Bangladesh

[6]Resident, Rheumatology, Bangabandhu Sheikh Mujib Medical University, Bangladesh

*Corresponding author: Richmond Ronald Gomes, Professor of Medicine, Ad-din Women's Medical College Hospital, Bangladesh, Email: rrichi.dmc.k56@gmail.com

Abstract

Background: Child-Pugh score is used as a prognostic tool while managing a patient with liver cirrhosis. It will be helpful to grade esophageal varices (EV) in cirrhotic patients by noninvasive predictors like Child-Pugh score without doing endoscopy in high risk patient or where endoscopic facilities is not available.

Objective: To evaluate the Child-Pugh Score as a predictor of esophageal varices in liver cirrhosis patients.

Method: This cross-sectional study was carried out at the Department of Medicine, Gastroenterology and Hepatology of Rangpur Medical College Hospital, Rangpur from June 2023 – November 2023 over a period of six months. By purposive sampling technique total 138 liver cirrhosis patients were included in the study. Data regarding age, sex, educational status, occupational status, marital status, monthly income, history of complications and investigations we reevaluated from patients' history sheet and documented Investigation result sheet. Collected data were analyzed with the help of SPSS software version 22. Results on continuous measurements were presented as mean & SD (min-max) and results on categorical measurements were presented as frequency & percentage. Significance will be assessed at 5% level of significance (p<0.05).

Results: Mean age of the study subjects was 42.16±12.68 years with a range of 19 to 72 years. Male to female ratio was 3.1:1. Ascites was mild in 54.3% cases and marked in 20.3% cases. Hepatic encephalopathy was mild in 23.9% cases and marked in 6.5% cases. Serum albumin was <2.8g/dl in 27.5% cases, 2.8-3.5g/dl in 71.0% cases and >3.5g/dl in 1.4% cases. Serum bilirubin was <2.0mg/dl in 55.1% cases, 2.0-3.0mg/dl in 29.7% cases and >3.0mg/dl in 15.2% cases. Prothrombin time prolongation was <4 sec in64.5% cases, 4.0 -6.0sec in29.0% cases and >6 sec in 6.5% cases. Twenty-three (16.7%) study subjects had no varices. Grading of oesophageal varices were 29.7% grade I, 37.0% grade II and 16.7% grade III. Child-Pugh classes were observed 3.6% class A, 74.6% class B and 21.7% class C. Area under ROC of Child Pugh score in predicting Oesophageal varices is 0.898. Child-Pugh score at a cutoff 8 was significant in prediction of oesophageal varices with sensitivity of 0.852, specificity of 0.826, positive predictive value (PPV) of 0.961 and negative predictive value of 0.528. Nineteen (13.8%) study subjects had variceal bleeding.

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Conclusion: Non-invasive Child-Pugh Score can predict the presence of EV in patients with cirrhosis. Hence, its application may decrease the burden of endoscopy.

Keywords: Child Pugh Score; Liver Cirrhosis; Endoscopy; Esophageal Varices; Prothrombin Time

Introduction

Gastro esophageal varices are one of the most common and severe complications of cirrhosis, and the presence of gastro esophageal varices is often correlated with severity. The overall prevalence of esophageal varices is 80% to 90% among the liver cirrhosis patients [1]. Gastric varices are present in 5% to 33% of patients with portal hypertension, with a lower incidence of hemorrhage but higher mortality [2]. Hemorrhage occurs at a yearly rate of 5% to 15% and is associated with a mortality of at least 20% at 6weeks despite significant improvements in its early diagnosis and treatment [3]. Although this complication is not included in the classical CTP score, variceal hemorrhage remains the main cause of hospitalization [4].

The Child–Turcotte–Pugh (CTP) score was developed in 1964 to evaluate the severity of liver dysfunction and predict survival in cirrhotic patients [5]. Initially, CTP score was proposed by Child and Turcotte to predict the operative risk in patients undergoing portosystemic shunt surgery for variceal bleeding. The primary version of Child–Pugh score included ascites, hepatic encephalopathy (HE), nutritional status, total bilirubin, and albumin. Pugh et al modified the Child–Pugh classification by adding prothrombin time or international normalized ratio (INR) and removing nutritional status. Child–Pugh score, due to its briefness and fairly good predictive value, has been used worldwide to evaluate liver function, predict outcomes, and optimize organ allocation for cirrhotic patients [6].

There have been few reports on predictive scores that include variceal status for outcome prediction in cirrhosis patients [7]. Cirrhotic patients were categorized according to Child-Pugh score [8]. The cirrhosis class is based on the total score. The prognosis is directly related to the score [5]. Esophageal varices were classified as small, medium and large according to World Gastroenterology Organization [9].

Materials and Method

This cross-sectional observational study was conducted on patients admitted in the department of medicine, gastroenterology and Hepatology of Rangpur Medical College Hospital, Rangpur from June, 2023 to November 2023. A total of 138 patients were selected through purposive sampling.

Inclusion criteria: a) Diagnosed patients of Liver cirrhosis b) Both male & female c) Age more than 18 years d) Participants and / or legally accepted guardians who gave consent and willing to comply with study procedure.

Exclusion criteria: a) Haemodynamically unstable cirrhotic patients b) Patients taking propranolol and/or has Endoscopic band ligation (EBL) for esophageal varices c) Unwilling to participate in the study. Computer based statistical analysis were carried out with appropriate techniques and systems with the help of professional statistician. All data were recorded systematically in preformed data collection form (questionnaire) and quantitative data were expressed as mean and standard deviation and qualitative data were expressed as frequency distribution and percentage. Statistical analysis was performed by using window-based computer software devised with Statistical Packages for Social Sciences (SPSS-22) (SPSS Inc, Chicago, IL, USA). 95% confidence limit was taken. The summarized data was interpreted accordingly and was then presented in the form of tables.

Results

Table 1 shows distribution of the study subjects according to age. Mean age of the study subjects was 42.16 ± 12.68 years with a range of 19 to 72 years. Maximum patients were in age group 29–38 years (26.8%) followed by 49–58 years (23.9%), 39– 48years (21.7%), 19– 28years (16.7%) and above 58 years (10.9%).

Age(years)	Frequency(n)	Percentage (%)
19-28	23	16.7
29-38	37	26.8
39-48	30	21.7
49-58	33	23.9
>58	15	10.9
Mean± SD	42.16±12.68	
Min-max	19–72	

Table 1: Distribution of the study subjects according to age (n=138).

Males (n=104) (75.4%) were predominant than females (n=34) (24.6%). Male to female ratio was 3.1:1.

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Figure 1 shows maximum patients were illiterate (n=49) (34.8%) followed by Secondary level (n=33)(23.9%), primary level (n=29)(21.0%), graduate (n=14) (10.1%) and Higher secondary level (n=13)(9.4%) of education.
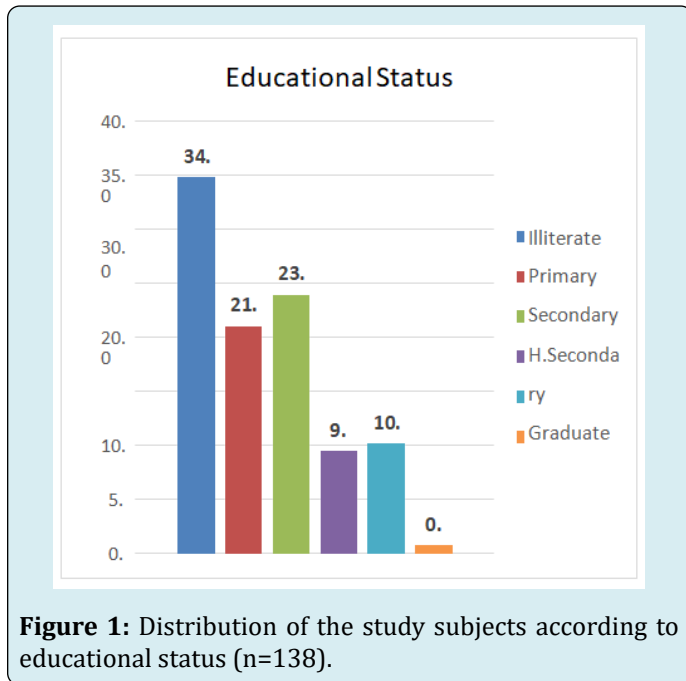

Figure 1: Distribution of the study subjects according to educational status (n=138).

Table 2 shows distribution of the study subjects according to marital status. Maximum patients were married (83.3%) followed by widow (9.4%) and unmarried (7.2%).

Marital status	Frequency(n)	Percentage (%)
Married	115	83.3
Unmarried	10	7.2
Widow	13	9.4

Table 2: Distribution of the study subjects according to marital status (n=138).
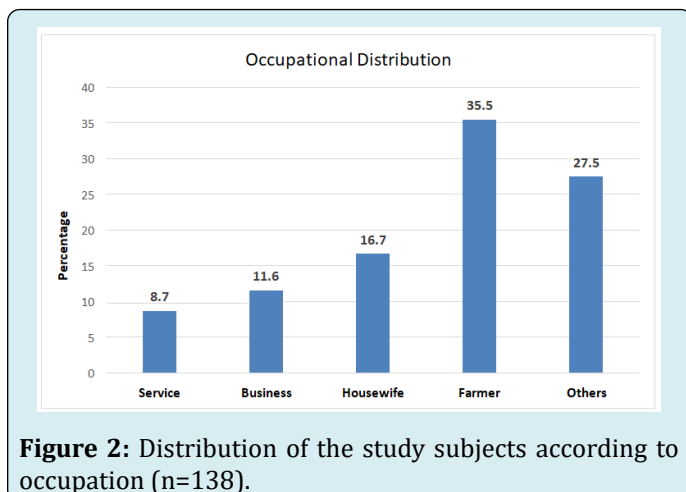

Figure 2: Distribution of the study subjects according to occupation (n=138).

Figure 2 shows study subjects according to occupational status. Most are farmers (35.5%) (n=49).

Table 3 shows distribution of the study subjects according to monthly income. Maximum patients had monthly income <Tk. 20,000 (63.8%) followed by 29.7%had Tk.20,000 – Tk.40,000 and only 6.5% had >Tk. 40,000.

Monthly income	Frequency(n)	Percentage (%)
<20,000	88	63.8
20,000-40,000	41	29.7
>40,000	9	6.5

Table 3: Distribution of the study subjects according to monthly income (n=138).

Table 4 shows clinical and laboratory findings regarding Child-Pugh score. Ascites was mild in 54.3% cases and marked in 20.3% cases. Hepatic encephalopathy was mild in 23.9% cases and marked in 6.5% cases. Serum albumin was <2.8g/dl in 27.5% cases, 2.8-3.5g/dl in 71.0% cases and >3.5g/dl in 1.4% cases. Serum bilirubin was<2.0mg/dl in 55.1% cases, 2.0-3.0mg/dl in 29.7% cases and >3.0mg/dl in 15.2% cases. Prothrombin time prolongation was <4 sec in 64.5% cases, 4.0 - 6.0 sec in 29.0% cases and >6 sec in 6.5% cases.

	Frequency(n)	Percentage (%)
Ascites Absent	35	25.4
Mild	75	54.3
Marked	28	20.3
Hepatic encephalopathy		
Absent	96	69.6
Mild	33	23.9
Marked	9	6.5
Serum albumin		
<2.8g/dl	38	27.5
2.8-3.5g/dl	98	71
>3.5g/dl	2	1.4
Serum bilirubin		
<2mg/dl	76	55.1
2-3mg/dl	41	29.7
>3mg/dl	21	15.2
Prothrombin time prolongation		
<4sec	89	64.5
4-6sec	40	29
>6sec	9	6.5

Table 4: Clinical and laboratory findings regarding Child-Pugh score (n=138).

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Figure 3 shows twenty-three (16.7%) study subjects had no varices. Grading of oesophageal varices were 29.7% grade I, 37.0% grade II and 16.7% grade III.
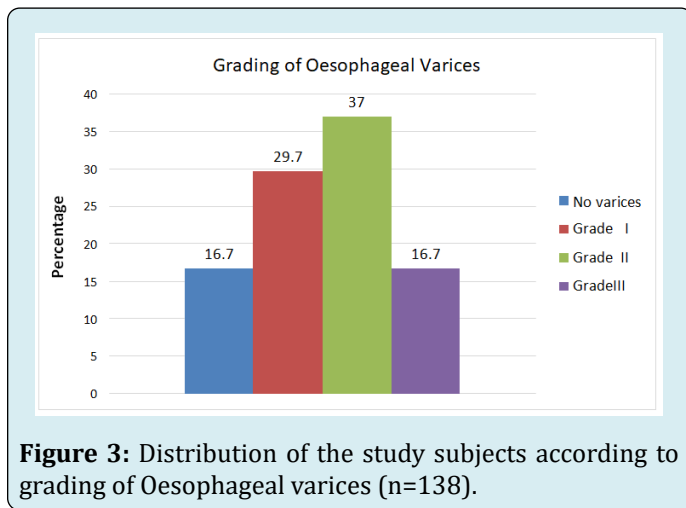

Figure 3: Distribution of the study subjects according to grading of Oesophageal varices (n=138).

Table 5 shows distribution of the study subjects according to Child-Pugh classed. Child-Pugh classes were observed 3.6% class A, 74.6% class B and 21.7% class C.

Child Pugh's score	Frequency(n)	Percentage (%)
Class A	5	3.6
Class B	103	74.6
Class C	30	21.7

Table 5: Distribution of the study subjects according to Child Pugh's score (n=138).

Tables 6-8 shows association of grading of oesophageal varices with Child Pugh's score. Among 23 no varices cases, 4 (17.4%) were Child-Pugh class A and 19 (82.6%) were Child-Pugh class B. Among 41 grade I oesophageal varices, 37 (90.2%) were Child-Pugh class B, 4(9.8%) were Child-Pugh class C. Among 51 grade II oesophageal varices, 36 (70.6%) were Child-Pugh class B and 14 (27.5%) were Child-Pugh class C. Among 23 grade III oesophageal varices, 11 (47.8%) were Child-Pugh class B and 12 (52.2%) were Child-Pugh class C. Higher grade of esophageal varices was seen in the more advanced class of Child-Pugh classes. There was significant association between grading of esophageal varices and Child- Pugh classes.

Child Pugh's score	No varices	Oesophageal varices			p-value
		Grade I	Grade II	Grade III	
Class A	4(17.4%)	0(0.0%)	1(1.9%)	0(0.0%)	<0.001
Class B	19(82.6%)	37(90.2%)	36(70.6%)	11(47.8%)	
Class C	0(0.0%)	4(9.8%)	14(27.5%)	12(52.2%)	
Total	23	41	51	23	

Table 6: Association of grading of oesophageal varices with Child Pugh's score (n=138).

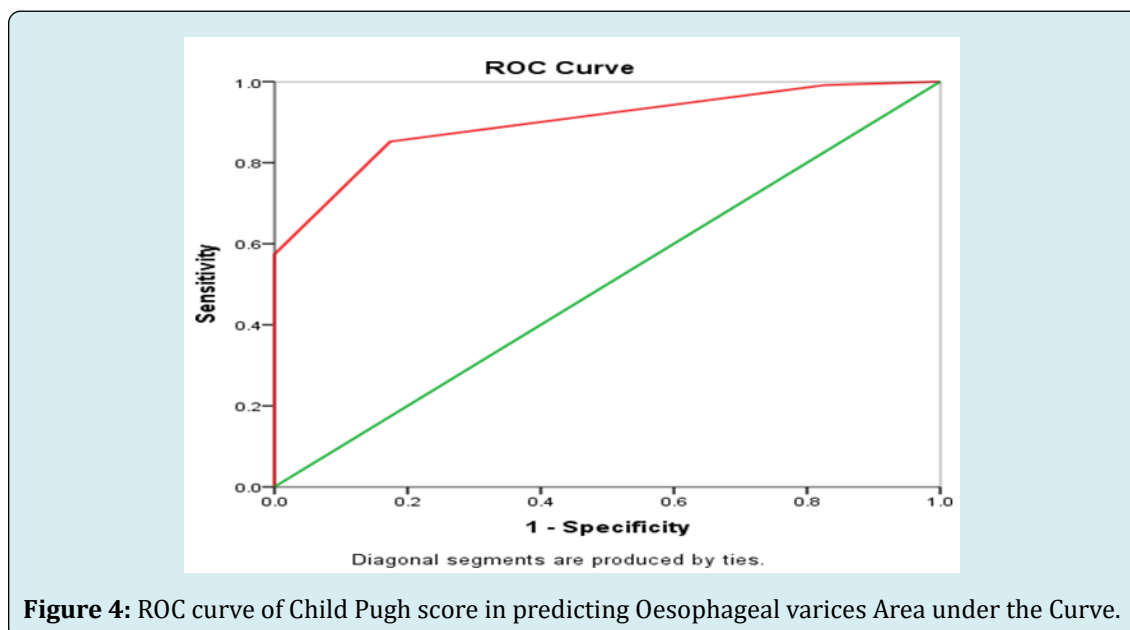**Figure 4:** ROC curve of Child Pugh score in predicting Oesophageal varices Area under the Curve.

Asymptotic 95% CI				
Area	**SE**	**p-value**	**Lower Bound**	**Upper Bound**
0.898	0.028	0	0.843	0.954

Table 7: Area under ROC of Child Pugh score in predicting Oesophageal varices is 0.898. Child-Pugh score would be considered to be "good" at predicting Oesophageal varices.

Child Pugh score	Sensitivity	Specificity	PPV	NPV	Youden Index
5	1	0.049	0.833	1	0.049
7	0.991	0.434	0.857	0.909	0.425
8	0.852	0.826	0.961	0.528	0.678
9	0.574	0.992	1	0.318	0.566
10	0.261	1	1	0.213	0.261
11	0.148	1	1	0.19	0.148

Table 8: Youden index of Child-Pugh score in predicting oesophageal varices.

According to Youden index best cut off value of Child-Pugh score is 8 in predicting oesophageal varices.

Child-Pugh score at a cut off 8was significant in prediction of oesophagel varices with sensitivity of 0.852, specificity of 0.826, positive predictive value (PPV) of 0.961 and negative predictive value of 0.528.

Table 9 shows variceal bleeding status of the study subjects. Nineteen (13.8%) study subjects had variceal bleeding.

Variceal bleeding	Frequency(n)	Percentage (%)
Present	19	13.8
Absent	119	86.2

Table 9: Distribution of the study subjects according to variceal bleeding (n=138).

Discussion

Mean age of the study subjects was 42.16 ± 12.68 years with a range of 19 to 72 years. Maximum patients were in age group 29 –38 years (26.8%) followed by 49 – 58 years (23.9%), 39 – 48 years (21.7%), 19 – 28 years (16.7%) and above 58 years (10.9%). In one study, maximum patients were from 39-59 years age group (48.7%) followed by 12(32.4%) subjects from 60 years of age & above and 7(18.9%) patients from 18-38 years. Males (75.4%) were predominant than females (24.6%) [9]. Male to female ratio was 3.1:1. Among 37 patients, 27(73%) were male and 10(27%) were female in the study of Sumon, et al. (2013) [9].

Ascites was mild in 54.3% cases and marked in 20.3% cases. Hepatic encephalopathy was mild in 23.9% cases and marked in 6.5% cases. Serum albumin was <2.8g/dl in 27.5% cases, 2.8-3.5g/dl in71.0% cases and >3.5g/dl in1.4% cases. Serum bilirubin was <2.0 mg/dl in 55.1% cases, 2.0-3.0 mg/dl in 29.7% cases and >3.0mg/dl in 15.2% cases. Prothrombin time prolongation was <4 sec in 64.5% cases, 4.0 - 6.0 sec in 29.0% cases and >6 sec in 6.5% cases.

Child-Pugh classes were observed 3.6% class A, 74.6% class B and 21.7% class C. Child-Pugh classes were observed 3(8.2%) Class A, 17(45.9%) Class B and 17(45.9%) Class C [9].

Twenty-three (16.7%) study subjects had no varices. Grading of oesophageal varices were 29.7% grade I, 37.0% grade II and 16.7% grade III. Grades of esophageal varices were 13(35.1%) F1, 20(54.1%) F2 and 4(10.8%) F3 patients among total patients [9].

Among 23 no varices cases, 4 (17.4%) were Child-Pugh class A and 19 (82.6%) were Child-Pugh class B. Among 41 grade I Oesophageal varices, 37 (90.2%) were Child-Pugh class B, 4 (9.8%) were Child-Pugh class C. Among 51 grade II Oesophageal varices, 36 (70.6%) were Child-Pugh classB and 14 (27.5%) were Child-Pugh class C. Among 23 grade III Oesophageal varices,11(47.8%) were Child-Pugh class B and 12 (52.2%) were Child-Pugh class C. Higher grade of esophageal varices was seen in the more advanced class of Child-Pugh classes. There was significant association between grading of esophageal varices and Child Pugh

classes. This study result was similar with Sumon, et al. and Thapa, et al. where they had similar correlation between Child Pugh's score where grade B and C were associated with higher grade of varices [9,10]. A statistically significant positive relation was found that higher grade of esophageal varices was seen in the more advanced class of Child-Pugh classes with a p value 0.001 [9].

Area under the curve (AUC) of Child Pugh score in predicting Oesophageal varices is 0.898. Child-Pugh score would be considered to be "good" at predicting Oesophageal varices. Child-Pugh score at a cutoff 8 was significant in prediction of oesophageal varices with sensitivity of 0.852, specificity of 0.826, positive predictive value (PPV) of 0.961 and negative predictive value of 0.528. Child-pugh score was significant in prediction of oesophageal varices with advanced score [11]. Nineteen (13.8%) study subjects had variceal bleeding.

However, the relationship between Child Pugh score and oesophageal varices is not consistent. Some studies fail to show a relationship between oesophageal varices and Child Pugh score [12-15].

Conclusion

Bleeding from esophageal varices is the most clinically relevant complication of liver cirrhosis and still carries a high mortality which increases as Child-Pugh score rises. Non-invasive Child-Pugh score can predict the presence of EV inpatients with cirrhosis. Hence, its application may decrease the burden of endoscopy and provide a tool for selecting patients for whom endoscopy may be beneficial.

Limitations

The limitations of the study are it was a single center study with relatively small sample size. Aetiological factors could not be assessed in the study.

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