Section: Medicine

Original Research Article

ROLE OF NON-INVASIVE TESTS FOR PREDICTION OF ESOPHAGEAL VARICES IN PATIENTS WITH CIRRHOSIS OF LIVER

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Received *: 20/09/2025*
Received in revised form *: 05/11/2025*
Accepted *: 26/11/2025*

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DOI: 10.70034/ijmedph.2025.4.375

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (4); 2090-2097

ABSTRACT

Background: Portal hypertension is a common consequence in cirrhosis and can cause variceal bleeding, ascites and hepatic encephalopathy. Upper Gastrointestinal endoscopy (UGIE) is considered the gold standard for the detection of esophageal varices. Few studies have reported association of lower platelet counts, lower mean platelet count/spleen diameter, portal vein diameter, Aspartate Aminotransferase to Platelet Ration Index (APRI) score and Fibrosis index based (FIB-4) score with esophageal varices. This study was done to ascertain the effectiveness of such non-invasive techniques in prediction of esophageal varices.

Materials and Methods: A cross sectional study was conducted in the Department of Medicine, Regional Institute of Medical Sciences, Imphal from 2023-2025 for all chronic liver disease patients >18years. Ultrasonography and UGIE were done and Child-Pugh score, APRI and FIB-4 scores were calculated.

Results: 149 cirrhotic patients were enrolled with esophageal varices detected in 88 patients and majority patients (70) were in Child class A. Patients with varices had significantly higher spleen diameter, portal vein diameter, PVD and lower mean platelet count/spleen diameter than those without varices. The APRI and FIB 4 scores was also found to be significantly higher in patients with esophageal varices.

Conclusion: Patients with large esophageal varices had significantly higher mean APRI score and FIB 4 score, lesser mean platelet count/spleen diameter ratio. APRI, FIB-4 score, spleen diameter and portal vein diameter could serve as a reliable non-invasive screening modality for predicting the presence and grading of esophageal varices in cirrhotic patients and help in initiating prophylactic treatment where endoscopy is unavailable.

Keywords: Non-invasive tests, esophageal varices, cirrhosis of liver, Child-Pugh score, APRI and FIB-4 scores, mean platelet count/ splenic diameter.

INTRODUCTION

Portal hypertension is a major hallmark of cirrhosis of liver and is defined as a portal pressure gradient exceeding 5-10 mm Hg. In portal hypertension, there is development of varices by portosystemic collaterals which decompress the portal circulation. Esophageal varices and gastrointestinal (GI) bleeding are serious complications in patients with portal hypertension. In compensated cirrhosis, esophageal varices are present in about 60% of patients and 80% in decompensated disease and ascites.[1] In cirrhotic patients without varices, there is appearance of esophageal varices at a rate of nearly 5% per year,[2] size increasing with time. Annually, there is nearly 12% progression to large

varices from small esophageal varices.[3] In patients with liver cirrhosis with no upper GI bleed in the past annually, there is 4% incidence of first variceal bleeding,[4] the risk of which is related to the size of the varices. Large esophageal varices are at a higher risk; due to a higher variceal wall tension in them.[5] Therefore, annual incidence of gastrointestinal bleeding is 15–20% in patients with large esophageal varices, 5% in patients with small esophageal varices and only 1–2% in patients without varices.[6]

An episode of variceal bleeding has a mortality rate of around 15-20% within the first week,[7] which may an underestimation due to death of some patients with massive variceal bleeding who do not reach the hospital on time. Thus, prevention of such bleeding is expected to improve the survival of these patients. The incidence of first variceal bleeding in patients with esophageal varices can be reducted by long-term administration of beta-adrenergic receptor antagonists.[7]

Upper gastrointestinal endoscopy (UGIE) is the gold standard for diagnosing and grading gastroesophageal varices.[8] However, it is an invasive procedure that may not be suitable for all patients, especially those with advanced liver disease or coagulopathy. Additionally, endoscopy may not be readily available in all healthcare settings and, if varices are present, it should be treated with beta-adrenergic receptor antagonists. These recommendations suggest that there could be high cost burden on patients with cirrhosis and that endoscopic units will be overburden. Many invasive endoscopic procedures turn out to be negative for varices due to low prevalence of 9–36% of major esophageal varices in cirrhosis patients who have not bled. Therefore, non-invasive methods for identifying esophageal varices are required to limit the number of endoscopies.

Platelet count, splenomegaly, Aspartate Aminotransferase to Platelet Ration Index (APRI) score, Fibrosis index based (FIB-4) score, Child Pugh class and high portal vein diameter (in ultrasonography) (USG) have emerged as promising non-invasive markers in several researches, for the estimation of large esophageal varices in cirrhotic patients.[9-15]Therefore the study was conducted to evaluate the utility of various clinical, biochemical and ultrasonographic findings for prediction of esophageal varices in patients with liver cirrhosis.

MATERIALS AND METHODS

This was a cross sectional study conducted for a period of two years from April, 2023 to March, 2025, in the Department of Medicine, Regional Institute of Medical Sciences (RIMS), Imphal. Patients with chronic liver disease attending Liver clinic, Medicine OPD and those admitted in the Medicine wards, RIMS were recruited.

Inclusion criteria included all patients above 18 years and <70 years age diagnosed cirrhosis based on clinical, biochemical and ultrasound findings.

Exclusion criteria: Patients with history of variceal bleed, previous endoscopic variceal ligation/sclerotherapy, current or past treatment with beta blockers, hepatocellular carcinoma (HCC), portal vein thrombosis, acute hepatitis patients, haematological disorders causing thrombocytopenia, drugs causing thrombocytopenia and those not giving consent for the study were excluded.

Sample size: This study`s prevalence of esophageal varices has been used to calculate the sample size. A study conducted by Gunda et al [16] published in BMC Gastroenterology journal found that 39.5% to have esophageal varices on endoscopic examination in patients with chronic liver disease.

P=39.5, q=60.5, L= being the allowable error = 8

using the formula = 4pq/L^2 , p = prevalence, q= 100-p. Sample size = 4×39.5×((100-39.5))/8X8= 149

Total sample size is 149.

Study Procedure: All patients underwent a detailed clinical evaluation after informed consent. Relevant history, etiology of liver disease (alcohol intake, blood transfusion etc), and physical characteristics including age, gender, symptoms and signs of liver failure, hepatomegaly, splenomegaly, ascites and abdominal vein collaterals were recorded. Biochemical investigations included determination of complete haemogram (CBC), liver function test (LFT), prothrombin time /international normalized ratio (PT INR), blood sugar and lipid profile. For each patient, Child-Pugh score, APRI and FIB-4 scores were calculated. All patients were tested for HBsAg and antibodies to hepatitis C virus using enzyme immunoassays to determine the cause of liver cirrhosis. Tests for other causes of cirrhosis (serum ceruloplasmin and slit lamp examination for Wilson's disease, tests for autoantibodies for autoimmune liver disease, iron studies for hemochromatosis) were carried out only if there was a suggestive clinical clue. Ultrasonography and UGIE were done and recorded for every patient.

Operational definitions: Ascites was graded as per International Ascites Club (IAC)system:

Grade 1: Mild ascites only detectable by ultrasound.

Grade 2: Ascites evident by moderate symmetrical distension of abdomen.

Grade 3: Large or gross ascites with marked abdominal distension.

Hepatic encephalopathy was graded from grade 0 to IV, as per the West Haven grading.

Esophageal varices were graded as I-III, using the modified Paquet grading system [16]. Furthermore, patients were classified dichotomously either as having large esophageal varices (grade III) or small varices (grade I-II).

Grade I: varices extending just above the mucosal level.

Varices extending just above the mucosal level and compression with air insufflation (left image)

Grade II: Varices projecting by one-third of the luminal diameter that cannot be compressed with air insufflation.

Grade III: Varices projecting up to 50% of the luminal diameter and in contact with each other.

Platelet count: Normal platelet count is 1.5lakhs to 4.5lakhs/µl. Thrombocytopenia is defined when platelet is <1.5lakh/µl.

APRI score: It is calculated using serum aspartate transaminase and platelet count.

APRI Score = AST(IU/L) / Platelet count (lakh/µl) ×100

FIB-4 score It is calculated using age, aspartate transaminase, alanine transaminase and platelet count and helps in estimating liver fibrosis.

FIB-4 score = Age (years) × AST (U/L)/ Platelet (lakh/µl) × [ALT(U/L)]1/2

Spleen diameter: It is measured by using 6-12MHz ultrasonography in the coronal plane posteriorly in supine position. The average adult spleen measures 100-110mm.The maximum cephalo-caudal measurement exceeding 130mm indicates splenomegaly.

Portal vein diameter: Portal vein diameter is measured where it crosses inferior vena cava anteriorly. In normal person portal vein diameter would not exceed 13mm in quiet respiration

Child-Turcotte-Pugh (CTP) score: It is calculated using serum bilirubin, serum albumin, international normalized ratio, ascites and encephalopathy. [17]

Table 1. Child-Pugh classification for severity of cirrhosis[17]

Clinical and Lab criterias	Points		
	1	2	3
Encephalopathy	None	Mild to moderate(grade 1 or 2)	Severe(grade 3 or 4)
Ascites	None	Mild to moderate(diuretic responsive)	Severe(diuretic refractory)
Bilirubin (mg/dl)	<2	2-3	>3
Albumin (g/dl)	>3.5	2.8-3.5	<2.8
Prothrombin time Seconds prolonged International normalized ratio	 <4 <1.7	 4-6 1.7-2.3	 >6 >2.3

The severity of cirrhosis:

Child-Pugh A: 5 to 6 points

Child-Pugh B: 7 to 9 points

Child-Pugh C: 10 to 15 points

Study tool:

- Ultrasonography of abdomen: Ultrasound machine Samsung Medison HS70A
- Endoscopic evaluation:Fujifilm EG-600WR v2 Gastroscope

Statistical Analysis: Statistical Package for the Social Sciences {SPSS}(IBM)version 21 was used for analysis. descriptive statistics such as mean, standard deviation and percentages were used for the summarizations of data. Independent t test was used to test the association between mean hemoglobin, Platelet count, spleen diameter, APRI score, FIB-4 score and portal vein diameter with esophageal varices. Chi-square test and fisher's exact test were employed to test the association between Child-Pugh classification and esophageal varices. Receiver operating characteristic curves (ROC) analysis was performed on the available data set for the parameter that had the best predictive value of the presence of large esophageal varices. For platelet count/spleen diameter ROC curve was created, and the diagnostic accuracy, sensitivity, specificity, PPV, and NPV were calculated. The p-value of less than 0.05 was taken as statistically significant.

Approval of research ethics board: Ethical approval for this study was obtained from the Research Ethics Board, Regional Institute of Medical Sciences, Imphal[No.A/206/REBComm(SP)/RIMS/2015/1018 /49/2023]. "Written informed consent" were taken from the patients. A unique code number was given and not disclosed to anyone outside the research team.

RESULTS

A total of 149 cirrhotic patients were enrolled fulfilling inclusion criteria. Maximum study subjects were males, 112(75.2%) while females were 37(24.8%). The baseline characteristics of the study subjects were shown in [Table 2].The mean age was 56.85 ± 7.68 years with a range of 30 years to 70 years with maximum patients belonging to the age group of 51 to 60 years (68, 45.6%). Alcohol (110, 73.8%) was the commonest etiology of CLD followed by NAFLD (15, 10.1%). On UGIE, 88 patients (59.1%) had esophageal varices and remaining 61 patients (40.9%) did not have varices. Majority patients (70, 47%) were in Child class A, followed by Child class B in (42, 28.2%) and Child class C (37, 24.8%). Distribution of the patients by biochemical investigations was given in [Table 3].In comparison to patients without varices, there was low mean Hb (8.18 ± 0.79 g/dl) and low mean platelet (PLT) count (105295.45 ± 38388.56 /µl) in patients who had varices. Association between biochemical, ultrasound findings and esophageal varices was shown in [Table 4]. Similarly, patients with esophageal varices had higher Aspartate Aminotransferase {AST level} (83.68 ± 28.70 U/L), low serum albumin (2.46 ± 0.52 g/dl), significantly higher spleen diameter(118.20 ± 17.69 mm),portal vein diameter(13.88 ± 0.77 mm) and lower mean platelet count/spleen diameter (773.97 ± 277.68). The APRI and FIB 4 scores (1.46 ± 0.45) and (3.23

± 1.13) respectively, was also found to be significantly higher in patients with esophageal varices, (p <0.05) than those without varices.

Our study showed no correlation between TLC, PT/ INR, blood urea and serum creatinine with esophageal varices. Association between esophageal varices and non invasive parameters was shown in [Table 5]. Further our study showed the mean APRI and FIB 4 scores in patients with large esophageal varices were (2.96 ± 1.45) and (7.20 ± 2.61), respectively and were found to be significantly higher in comparison to those with small varices (1.55 ± 1.24) and (4.26 ± 2.45) respectively (p<0.05). Similarly the mean platelet count/spleen diameter ratio was (684.42 ± 216.89) in patients with large varices was significantly lower than those with small varices (965.88 ± 299.40) (p<0.05). The mean portal vein diameter and mean spleen diameter was comparable between large and small esophageal varices. Association of various parameters with presence or absence of large esophageal varices was shown in table 6. Majority (29, 78.4%) of the patients in Child class C had esophageal varices in comparison to those with Child class B (26, 61.9%) and Child class A (33, 47.1%), as shown in table 6. The difference was found to be statistically significant (p<0.05).

Table 2: Baseline characteristics of the study subjects (N= 149).

Characteristics	Study subjects (n, %)
Age (in years)	
18 – 30	0 (0)
30 - 40	5(3.4%)
41 – 50	26(17.4%)
51 – 60	68(45.6%)
61 – 70	50(33.6%)
Gender	
Male	112(75.2%)
Female	37(24.8%)
Etiology	
Alcohol	110 (73.8%)
NAFLD*	15(10.1%)
Hepatitis B virus infection	10(6.7%)
Hepatitis C virus infection	5(3.4%)
Alcohol and NAFLD	3(2.0%)
Alcohol and Hepatitis B infection	3(2.0%)
Autoimmune	2(1.3%)
Alcohol and Hepatitis C infection	1(0.6%)
Ascites	
Present	102,68%
Absent	47(32%)
Grading of ascites	
Grade I	48(47%)
Grade II	29(28%)
Grade III	25(25%)
Upper GI endoscopy	
Esophageal varices	
Present	88(59.1%)
Absent	61(40.9%)
Child Pugh score	
Class A	70 (47%)
Class B	42(28.2%)
Class C	37(24.8%)

*NAFLD- non alcoholic fatty liver disease

Table 3: Distribution of the patients by biochemical investigations (N=149).

Sl.no.	Parameters	Esophageal varices (mean ± SD)		p value
		Yes	No	
1	Hemoglobin (g/dl)	8.18 ± 0.79	9.7 ± 1.24	< 0.001
2.	TLC (cells/mm3)	6842.05 ± 1171.67	7100.0 ± 1015.38	0.165
3.	Platelet count (per µl)	105295.45 ± 38388.56	156721.3 ± 40154.75	< 0.001
4.	S. bilirubin (mg/dl)	2.52 ± 0.68	2.18 ± 0.75	0.005
5.	S. AST (U/L)	83.68 ± 28.70	48.93 ± 14.04	< 0.001
6.	S. ALT (U/L)	74.82 ± 31.83	50.92 ± 15.03	< 0.001
7.	S. albumin (g/dl)	2.46 ± 0.52	2.67 ± 0.51	0.018
8.	INR	1.41 ± 0.18	1.45 ± 0.21	0.237
9.	PT (seconds)	18.89 ± 2.00	19.24 ± 2.14	0.303
10.	Blood urea (mg/dl)	39.24 ± 8.61	40.07 ± 8.51	0.563
11.	S.creatinine (mg/dl)	1.03 ± 0.19	1.05 ± 0.19	0.655
12.	Ascites	83	19	<0.001

*TLC – total leucocyte count, AST- Aspartate Aminotransferase, ALT- Alanine Aminotransferase,PT- Prothrombin time, INR- International normalized ratio (PT INR).

Table 4. Association between biochemical, ultrasound findings and esophageal varices (N = 149).

Sl.no.	Parameters	Esophagealvarices (mean ± SD)		p value
		Yes	No	
1	Spleen diameter (mm)	133.67 ± 13.95	109.90 ± 18.62	< 0.001
2	APRI score	2.51 ± 1.53	0.91 ± 0.61	< 0.001
3	FIB 4 score	6.27 ± 2.90	2.96 ± 1.96	< 0.001
4.	Portal vein diameter (mm)	12.92 ± 1.42	11.55 ± 1.01	< 0.001
5.	Platelet count/spleen diameter ratio	773.97 ± 277.68	1525.12 ± 510.77	< 0.001

* APRI -Aspartate Aminotransferase to Platelet Ration Index score, FIB-4 -Fibrosis index based

Table 5. Association between esophageal varices and non invasiveparameters (N=149).

Sl.no.	Parameters	Esophageal varices, n (%)		p value
		Yes	No	
1.	Child Pugh Classification			
	Class A	33 (47.1)	37 (52.9)	
	Class B	26 (61.9)	16 (38.1)	0.007
	Class C	29 (78.4)	8 (21.6)	
2.	Platelet count(lakh per µl)			
	<1.5	80 (80.0)	20 (20.0)	
	≥ 1.5	8 (16.3)	41 (83.7)	< 0.001
3.	Spleen diameter(mm)			
	≥ 130	57 (81.4)	13 (18.6)	
	< 130	31 (39.2)	48 (60.8)	< 0.001
4.	APRI			
	> 1.50	55 (87.3)	8 (12.7)	< 0.001
	≤ 1.50	33 (38.4)	53 (61.6)	
5.	FIB-4			
	> 3.25	67 (80.7)	16 (19.3)	
	≤ 3.25	21 (31.8)	45 (68.2)	< 0.001
6.	Portal vein diameter (mm)			
	> 13	48 (87.3)	7 (12.7)	
	≤ 13	40 (42.6)	54 (57.4)	< 0.001

Table 6. Relationship of various parameters with presence or absence of large esophageal varices (N=88)

Sl.no.	Parameters	Esophageal varices (mean ± SD)		p value
		Large varices	Small varices	
1	Spleen diameter (mm)	133.67 ± 14.39	133.68 ± 13.19	0.997
2	APRI score	2.96 ± 1.45	1.55 ± 1.24	< 0.001
3	FIB 4 score	7.20 ± 2.61	4.26 ± 2.45	< 0.001
4.	Portal vein diameter(mm)	13.10 ± 1.39	12.54 ± 1.41	0.085
5.	Platelet count (lakh/µl)	0.90 ± 0.27	1.27 ± 0.36	< 0.001
5.	Platelet count/ spleen diameter ratio	684.42 ± 216.89	965.88 ± 299.40	< 0.001
6.	Child Pugh Classification	Esophageal varices, n(%)		p value
		Large varices	Small varices	
	Class A	18 (54.5)	15 (45.5)	0.008
	Class B	16 (61.5)	10 (38.5)	
	Class C	26 (89.7)	3 (10.3)	

DISCUSSION

In this study a total of 149 patients with chronic liver disease were included. Most of the participants were males (112, 75.2%) and females were 37 patients (24.8%). Similar male preponderance were reported by Uppalapati S et al,[18] (90% males) and Parasuraman KS et al,[19] (60% males). Loaeza-del-Castillo A et al,[20] reported 64% male patients in chronic hepatitis C patients and 57% male patients in NAFLD and 95% male patients in autoimmune hepatitis in their study. This is largely due to the fact that men consume more alcohol than women do, in addition to other risk factors such as obesity and metabolic disorders, which are also more common in males.[21] Majority of the patients belonged to the age group of 51 to 60 years with 45.6% followed by 61 to 70 years with 33.6 % and 41 to 50 years with 17.4% which is similar to the study by Parasuraman KS et al.[19] The mean age of our study population was 56.85 ± 7.68 years which was comparable to Glisic T et al,[22] (62.4±13.14 years) and Patil S et al,[23] (53.85 ± 12.52 years).Alcohol (73.8%) was the commonest etiology for CLD in this study followed by NAFLD (15, 10.1%), hepatitis B infection (10, 6.7%) and hepatitis C infection (5, 3.4%) of patients , which was consistent with the findings by Mehta SK et al,[21] and Glisic T et al.[22]

In the current study, on UGIE, majority patients (88, 59.1%) had esophageal varices, which was lower than other studies done by de Mattos ÂZ et al,[24] (esophageal varices in 72.5%), Uppalapati S et al,[18] (70%) and Patil S et al,[23] (79.2%). The reason was most probably due maximum patients belonging to Child class B/C cirrhosis and hepatitis C related cirrhosis contrarily in our study majority belonged to Child class A (47%) cirrhosis and ethanol related cirrhosis (78.5%).In this study, maximum patients (70, 47%) belonged to Child class A, followed by

Child class B (42, 28.2%) and (37, 24.8%) patients in Child class C, which were comparable to the studies done by Mehta SK et al.[21]

The current study analysed and compared various clinical, biochemical tests among patients with varices and without varices. The mean Hb of the patients with varices (8.18 ± 0.79 g/dl) was significantly lower than those without varices (9.7 ± 1.24 g/dl) ($p<0.05$). The finding was consistent with the findings in majority of the studies,[18,23,25] while Glisic T et al,[22] reported a higher mean Hb in patients with varices, most probably due to intervention of blood transfusion in their patients. Platelet count was significantly lower in patients with varices (105295.45 ± 38388.56 /µl) than those without varices {156721.3 ± 40154.75/µ} ($p<0.05$) , which were similar to the studies done by Uppalapati S et al,[18] and Patil S et al.[23] On further analysis on platelet count, our study demonstrated the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of platelet count less than 1.5 lakh/µl in predicting esophageal varices were 90.9%, 67.2%, 80%, 85.4% and 81.2%, respectively, which was comparable to the platelet cut off (1.32 lakhs) by Mujahid N et al,[26] with the diagnostic sensitivity of 71.4%, specificity of 73.33%, PPV of 86.2% and NPV of 52.3%.

In this study, patients with varices had significantly higher ($p<0.05$) serum AST level (83.68 ± 28.70 U/L) and Alanine Aminotransferase {ALT} (74.82 ± 31.83 U/L) than those without varices, which was similar to the studies done by Glisic T et al.[22] Serum albumin of patients with varices (2.46 ± 0.52 g/dl) was also found to be significantly lower than those who did not have varices (2.67 ± 0.51 g/dl) ($p<0.05$), which was similar to the study done by Giannini EG et al.[27].Our study showed no correlation between TLC, PT INR, blood urea and serum creatinine with esophageal varices. Similar conclusions were drawn by Uppalapati Set al,[18] (with respect to PT, INR) and Glisic T et al,[22] (with respect to TLC and INR). However study by Jijo VC et al,[25] reported PT INR to be significantly higher among varices than those without varices.

The mean spleen diameter was found to be significantly more in patients with esophageal varices (133.67 ± 13.95 mm) in comparison to those patients without varices (109.90 ± 18.62 mm)($p<0.05$), which was consistent with the studies done by Patil S et al,[23] and Giannini EG et al,[27] On further analysis our study found that the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of spleen diameter of ≥ 130 mm in predicting esophageal varices were 64.7%, 78.6%, 81.4%, 60.7% and 70.4%, respectively. Similarly, the mean portal vein diameter (PVD) was significantly higher in patients with esophageal varices (13.88 ± 0.77 mm) than those without varices (11.31 ± 0.69 mm)($p<0.05$). Uppalapati S et al,[18] and Jijo VC et al,[25] also reported higher PVD and spleen diameter among patients with varices. In this study, the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of portal vein diameter > 13 mm in predicting esophageal varices were 54.5%, 88.5%, 87.3%, 57.4% and 68.5%, respectively.

In this study, the mean platelet count / spleen diameter (mean PLT/SD) was found to be lower in patients with esophageal varices (773.97 ± 277.68) in comparison to those patients without varices (1525.12 ± 510.77) ($p<0.05$), mean value was much higher than the study done by Zimbwa et al,[28] [median PLT/SD ratio in patients with varices was 537 (range 371–670) and with no varices 2229 (range 1542–3174)]. Study by Edoardo G. Giannini et al,[27] showed (mean PLT/SD) ratio had 86.0% (95% CI, 80.7–90.4%) diagnostic accuracy for EV, which was significantly greater as compared with either accuracy of platelet count alone (83.6%, 95% CI 78.0–88.3%, P = 0.038) or spleen diameter alone (80.2%, 95% CI 74.3–85.3%, P = 0.018).

The current study showed the mean APRI and FIB 4 scores in patients with esophageal varices were (1.46 ± 0.45 and 3.23 ± 1.13) respectively. These findings were found to be significantly higher when compared to patients not having varices (0.43 ± 0.11 and 1.13 ± 0.50) respectively ($p<0.05$). Similar findings were reported by Glisic T et al,[22] Supriyanto I et al,[29].and Sanyal AJ et al.[30]In this study, majority of the patients with APRI > 1.50 (55, 87.3%) was found to have esophageal varices in comparison to those patients whose APRI score was ≤ 1.50 (38.4%). The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of APRI > 1.50 in predicting esophageal varices were 62.5%, 86.9%, 87.3%, 61.6% and 72.5%, respectively. Similarly, majority (67, 80.7%) of the patients with FIB-4 score of>3.25 were found to have esophageal varices when compared with those patients with ≤ 3.25 (21, 31.8%). The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of FIB-4 score > 3.25 in predicting esophageal varices were 76.1%, 73.8%, 80.7%, 68.2% and 75.2%, respectively. de Mattos ÂZ et al,[24] set a cutoff of 1.3 for APRI and found the sensitivity of 64.7%, specificity of 72.7%, PPV of 86.5% and NPV of 43.2%. Even though there was a significant association between APRI score and FIB-4 score with esophageal varices, their sensitivity was below 80%. Majority of the patients with Child class C had esophageal varices (29, 78.4%) followed by patients with Child class B (26, 61.9%) and Child class A (33, 47.1%). The difference was found to be statistically significant ($p<0.05$). Giannini EG et al,[27] and Kassim Ahil et al,[31] also reported Child-Pugh score was significantly higher in patients with esophageal varices, thereby suggesting significant positive correlation of esophageal varices with the severity of cirrhosis categorized by CTP score.

CONCLUSION

This study showed the platelet count, APRI and FIB-4 scores, CTP class, platelet count/spleen diameter ratio can effectively be used as non-invasive tests for predicting the presence of esophageal varices and their grading in patients with liver cirrhosis. To provide appropriate primary preventive medication and to identify high-risk patients who require a referral to the tertiary hospital for endoscopic evaluation, the above parameters may be used by physicians working in healthcare facilities that have limited medical resources and where endoscopy is not easily available. These parameters can also help treating doctors in selecting patients who necessarily require an upper GI endoscopy thereby avoiding invasive and unnecessary endoscopies.

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