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Utility of EVendo Score as a Screening Tool for the Detection of High Risk Esophageal Varices in Pakistani Population

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Introduction: Endoscopy for the screening of esophageal varices (EVs) is costly and cannot be performed in remote areas with limited resources. Recently, certain non-invasive cost effective models have been proposed for the prediction of EVs but have failed recommendation on a larger

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scale. EVendo score is a recently developed bedside score for the detection of EVs. Therefore, our aim was to determine the utility of EVendo score as a screening tool for the detection of high risk esophageal varices in Pakistani population.

Methods: It was a cross sectional study which was conducted in the department of Hepatogastroenterology from January 2021-June 2022.All the patients of either gender aged greater than 18 years with newly diagnosed cirrhosis were included in the study while those patients with prior history of esophageal varices and variceal bleeding as well as those with acute liver failure, renal impairment, non-cirrhotic portal hypertension and those on anticoagulants were excluded from the study. Area under the receiver operating curve (AUROC) was obtained for EVendo score, Aspartate Transaminase to platelet ratio(APRI) and Platelet count to Splenic Diameter and diagnostic accuracy was obtained for these scores in predicting EVs and also in identifying HRVs.

Results: A total of 272 patients were enrolled in the study. Among them, 167(61.4%) were males. Most common cause of chronic liver disease was viral hepatitis.On screening endoscopy, EVs were noted in 118(43.4%) patients while high risk EVs (HRV) were noted in 47(17.3%) patients respectively. AUROC was obtained for EVendo score, APRI and Platelet count to Splenic Diameter in predicting EVs and also for identifying HRVs and it was 0.93 (p-value <0.001), 0.821(<0.001) and 0.842(p<0.001) respectively for the prediction of EVs with diagnostic accuracy of 86.76% and 0.852 (p-value <0.001), 0.835(<0.001) and 0.814(p<0.001) respectively for identifying HRVs with a diagnostic accuracy of 84.19%.

Conclusion: The performance of EVendo score was reliable and better than the other non-invasive scores in predicting EVs in our population with an excellent sensitivity and diagnostic accuracy in predicting the EVs and also in identifying HRVs. However, studies comprising larger sample sizes are required in this regard.

Keywords: EVendo; esophageal varices; high risk varices.

1. INTRODUCTION

Esophageal varices (EVs) is potentially one of the fatal manifestations of cirrhosis with a prevalence of EV in cirrhosis ranging between 60% and 80% throughout life along with increased risk of mortality with variceal bleeding [1,2]. Due to increased tendency of re-bleeding in patients with prior history of variceal bleed, the prediction of the presence of esophageal varices (EVs) and its prevention are the major concerns in patients with Liver Cirrhosis [3].

The prevalence of EVs in cirrhotic patients is approximately 15% to 25%. Most of the patients go through screening endoscopy either don't have varices or have varices that are of low risk and don't need any medical intervention [4]. These patients don't directly get benefited from upper GI endoscopy (EGD). Instead, they are exposed to higher risks of anesthetic and procedure-related complications, delayed drug clearance, coagulopathy, and many more factors as compared to the rest of the population [5]. Therefore, in order to reduce the burden of unnecessary endoscopies, identification of the population requiring variceal screening such as those with high risk EVs is essential.

In the recent times, multiple non-invasive models have been proposed for the probability of the presence of esophageal varices [2,6,7]. One such score is the platelet count/spleen diameter ratio, which has a high negative predictive value for the presence of EVs [8]. Another is the Baveno VI criteria, which involves hepatic transient elastography [6,7]. Another one is Glasgow Blatchford score (GBS) with an effective role in recognizing critically ill patients who ultimately get benefit from therapeutic endoscopic interventions [9]. Liaoning Score has also shown its utility as a non-invasive predictor of esophageal varices in the local population [10].

Despite their accuracy, these models haven't been in practice in many setups because the information needed in them and the variables used in them, are not widely available. Secondly, several centers do not include spleen diameter in radiological reports, especially if there is no proof of enlarged spleen. Though elastography being more common, it is still not commonly available for several patients.

Thus, a more sensible, reliable and easily available scoring model was required to identify high risk EVs and to make it beneficial for those who can get advantage from EV screening and would be more useful clinically.

Dong T et al. [11] proposed a non-invasive score named EVendo score for the prediction of esophageal varices requiring treatment in an American population. At a cutoff of below 3.9, it had a high sensitivity of 95% and 94.6% in ruling out esophageal varices and those varices not requiring treatment respectively. It also revealed a high negative predictive value of 96% in ruling out varices that required treatment. Similarly, Alswat K et al. [12] validated EVendo score in an arab population and proposed a higher cutoff of < 4.5 in ruling out the patients with varices requiring treatment with a sensitivity of 83%.However, it lacked specificity.

The rationale of this study was that endoscopy services are unavailable in remote areas of Pakistan and urgent referral can be made to the tertiary care centers where timely performed intervention can decrease the risk of variceal bleeding. Secondly, this model can effectively avoid the unnecessary endoscopies thus avoiding the risks related to procedure and costs of inessential EGDs.

1.1 Aims

Therefore, our aim was to determine the diagnostic utility of EVendo score in predicting the presence of esophageal varices and secondly to predict the presence of high risk esophageal varices in Pakistani population

1.2 Operational Definition

1.2.1 Esophageal Varices [13]

The diagnosis of esophageal varices on endoscopy was documented as the presence of abnormally enlarged, tortuous or coiled shaped dilated veins within the linings of esophagus.

1.2.2 High risk esophageal varices (HRVs): Varices with a tendency to bleed [14]

Grade 2 – Beading appearance of esophageal varices on endoscopy
Grade 3 – large, tortuous with a tumefactive appearance of varices on endoscopy running in an oblique course

1.2.3 Cirrhosis of liver [15]

Presence of three or more of the following were considered as cirrhosis of liver

- Altered echo texture of liver
- Irregular liver margins
- Spleen size more than 12cm
- Portal vein diameter greater than 12mm
- Presence of free fluid in abdominal cavity

2. MATERIALS AND METHODS

2.1 Study Design

Cross sectional study.

2.2 Setting

All patients who presented to the outpatient department (OPD) of Hepatogastroenterology (GI-OPD), SIUT, Karachi, newly diagnosed with liver cirrhosis (as per operational definition) on percutaneous ultrasound abdomen, from January 2021-June 2022 were enrolled in this study. While, the excluded patients included those with prior history of endoscopy for EV screening, surveillance, or treatment; or a prior endoscopy that incidentally revealed EV; non-cirrhotic etiologies for portal hypertension; cirrhotic patients under the age of 18 years, patients with renal disease or those with hemoglobinopathies, the patients on anticoagulants that would affect international normalized ratio (INR), the patients with an episode of acute liver injury within 6 months before their screening EGD , those with history of acute variceal bleed and lastly those refusing to give consent.

2.3 Sample Size

A sample size of 234 was given by the institutional statistician with expertise in medical researches.

2.4 Sample Technique

Non probability consecutive sampling.

2.5 Data Collection Procedure

After taking the informed consent, the patients fulfilling the inclusion criteria were enrolled in the study. Blood sample was drawn for the platelet count, serum albumin, international normalized ratio (INR) and total bilirubin to calculate CTP score. To document the etiology of cirrhosis, blood sample for Hepatitis B surface antigen (HbsAg) and Anti Hepatitis C antibody were requested. History was taken regarding the alcohol intake, diabetes, hypertension and other comorbidities. All the patients then underwent abdominal ultrasound for measurement of ascites and other finding of liver cirrhosis. It was performed by a consultant radiologist; using US machine (TOSHIBA-apleo 50 Model MCM17545TS). Esophagogastroduodenoscopy

(EGD) was performed by a gastroenterologist with atleast 5 years experience in perfoming endoscopic interventions to document the presence or absence of EVs along with the presence or absence of high risk EVs. All tests were done free of cost as per institutional policy. Exclusion criteria was followed strictly to avoid confounding variables.

2.6 Data Analysis Procedures

The data was entered and analyzed using SPSS version 22.0.Continuous variables were expressed as mean +S.D. while categorical variables were expressed as frequencies and percentages. Continuous variables were analyzed using the student t-test while categorical variables were analyzed using the Chi square test. EVendo score was calculated using the formula:

EVendo Scoring [11]: EVendo scoring will be calculated according to the following formula

A = (8.5 x INR) + (AST, U/L / 35)

B = (Platelet count, x 10^3/μL / 150) + (BUN, mg/dL / 20) + (Hemoglobin, g/dL / 15)

EVendo Score = (A / B) + 1 (if ascites present)

APRI score was calculated using the formula:

APRI score: [(AST/ULN)/Platelet count$x10^9$/L] x100

Platelet count to splenic diameter was calculated using the formula:

PCSD: = Platelet Count(10^9/L)/Splenic Diameter (mm) [13,16]

Area under the receiver operating curve (AUROC) was obtained for EVendo score, APRI score and Platelet count to splenic diameter for the prediction of not only the presence or absence of EVs but also the high risk EVs. At an optimal cutoff, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy was obtained for the EVendo score for the presence of EVs and also for the prediction of high risk EVs.

3. RESULTS

A total of 272 patients were enrolled in the study. Among them,167(61.4%) were males and 105(38.5%) were females. Most common cause of chronic liver disease was hepatitis C which was observed in 147(54%) patients followed by hepatitis B in 98(36%), non-alcoholic fatty liver disease in 16(6%) and autoimmune hepatitis in 11(4%) patients respectively. Most of the patients belong to Child Pugh class (CTP) A i.e. 180(66.2%) out of 272 patients while 74(27.2%) patients had CTP class B and 18(6.6%) patients had CTP class C respectively at the time of presentation. Ascites was observed in 32(11.7%) of the patients. On screening endoscopy, EVs were noted in 118(43.4%) patients while high risk EVs (HRV) were noted in 47(17.3%) patients respectively. Fundal varices were noted in 21(7.7%) patients. Mean Hemoglobin was 10.8+2.1 (g/L), International normalized ratio(INR) of 1.22+0.19, platelet count of 74.8+40.3(x10^3/μL / 150), aspartate transaminase (AST) of 59.2+52(U/L) and blood urea nitrogen(BUN) of 16.3+10.8(mg/dl) respectively. Mean EVendo score was of 18.5+7.2. (Table 1)

Area under the receiver operating curve was obtained for EVendo score in predicting EVs and it was 0.93 (p-value <0.001).(Fig. 1) At a cut off of >7.3, it had a sensitivity of 94.92%,specificity of 80.52%,positive predictive value of 78.87%,negative predictive value of 95.38% and diagnostic accuracy of 86.76% in predicting EVs.(Table 2)

Area under the receiver operating curve was also obtained for EVendo score in predicting HRVs and it was 0.852 (p-value<0.001). (Fig. 2) At a cutoff of >8,it had a sensitivity of 87.23%,specificity of 83.56%,positive predictive value of 53.46%,negative predictive value of 96.91% and diagnostic accuracy of 84.19%.(Table 2)

4. DISCUSSION

Previously, studies have shown that most newly diagnosed cirrhotic patients undergoing endoscopy haven no evidence of EVs on index endoscopy [16,17]. Previously, a large meta-analysis comprising of over 30 studies showed that the prevalence of EVs ranged from 15-72% and that of HRVs was around 6-26% [18]. Our data also depicted similar results as only 43% of the patients were found to have EVs on screening endoscopy and only 17.3% patients had HRVs. Therefore, this urges the need for non-invasive cost-effective assessment tools for the detection of esophageal varices and prediction of HRVs.

Table 1. Baseline characteristics of the population included in the study (n-272)

Study population		**n(%)**
Mean age(years±S.D)		43.56±12.42
Gender	Male	167(61.4)
	Female	105(38.6)
Etiology of Chronic liver disease	Hepatitis C	147(54)
	Hepatitis B	98(36)
	NAFLD*	16(6)
	AIH**	11(4)
Hemoglobin(g/dL)		10.8±2.1
Total Leucocyte Count(x10^9/L)		4.5±2.4
Platelet Count(x10^9/L)		74.8±40.2
Total Bilirubin(mg/dl)		1.3±0.75
Alkaline Phosphatase(IU/L)		190±187
Aspartate Transaminase(AST)(IU/L)		59±52
Alanine Transaminase(ALT)(IU/L)		45±34
Gamma Glutamyl Transpeptidase(GGT)(IU/L)		74±59
Blood urea Nitrogen(BUN)(mg/dl)		16.3+10.8
Serum Albumin(g/dl)		3.38+0.63
Child Turcotte Pugh Score	A	180(66.2)
	B	74(27.2)
	C	18(6.6)
Esophageal varices	Present	118(43.4)
	Absent	154(56.6)
High Risk EVs	Present	47(17.3)
	Absent	225(82.7)
EVendo Score		18.5+7.2

**NAFLD-Non Alcoholic Fatty liver Disease, **AIH-Autoimmune Hepatitis*

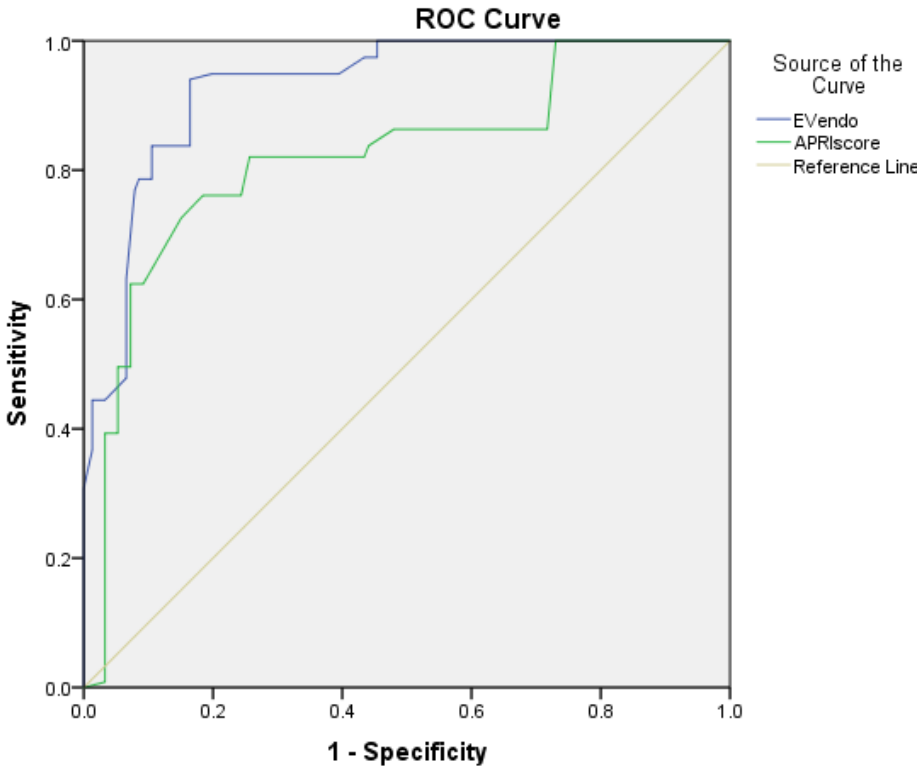

Fig. 1A

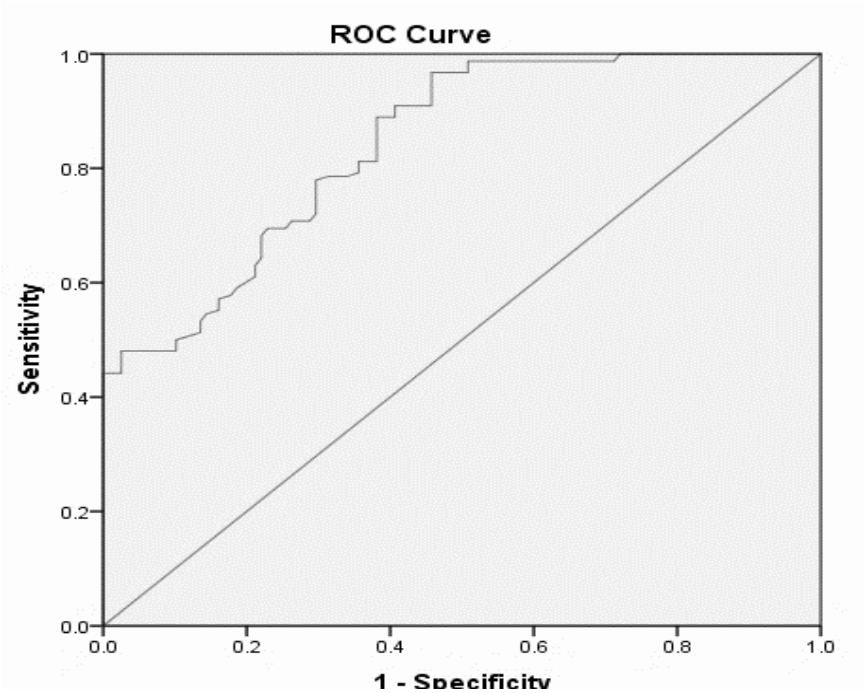

Fig. 1B

Fig. 1A: Area under the receiver operating curve for EVendo score, APRI and (Fig. 1B) Platelet count to splenic diameter for the prediction of esophageal varices is 0.93 (p-value <0.001), 0.821(<0.001) and 0.842(p<0.001) respectively

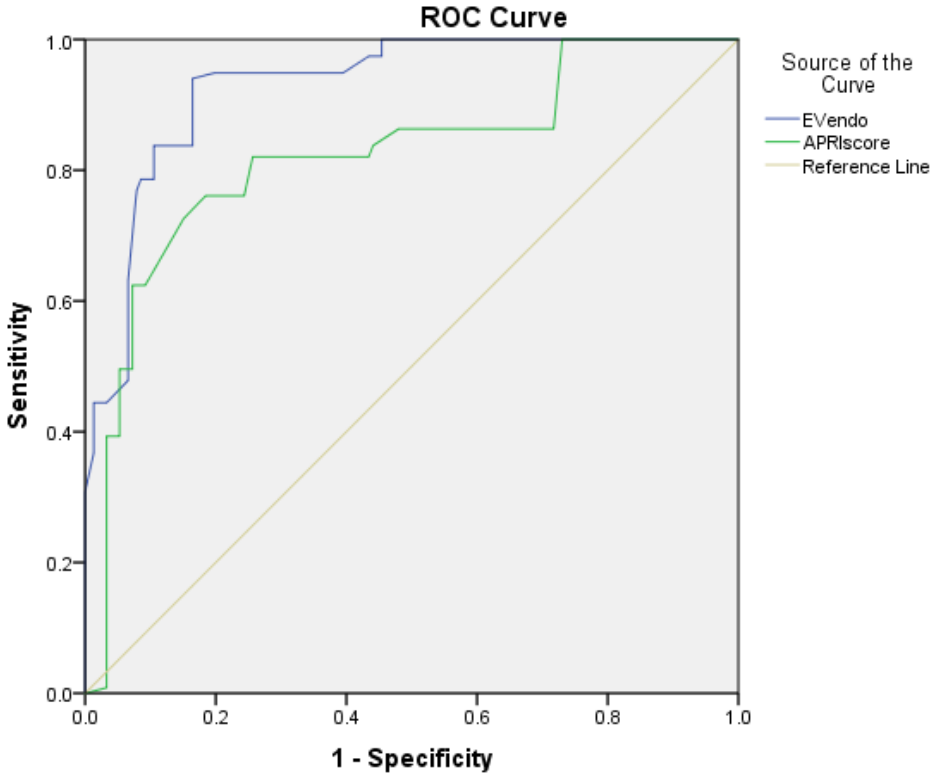

Fig. 2A

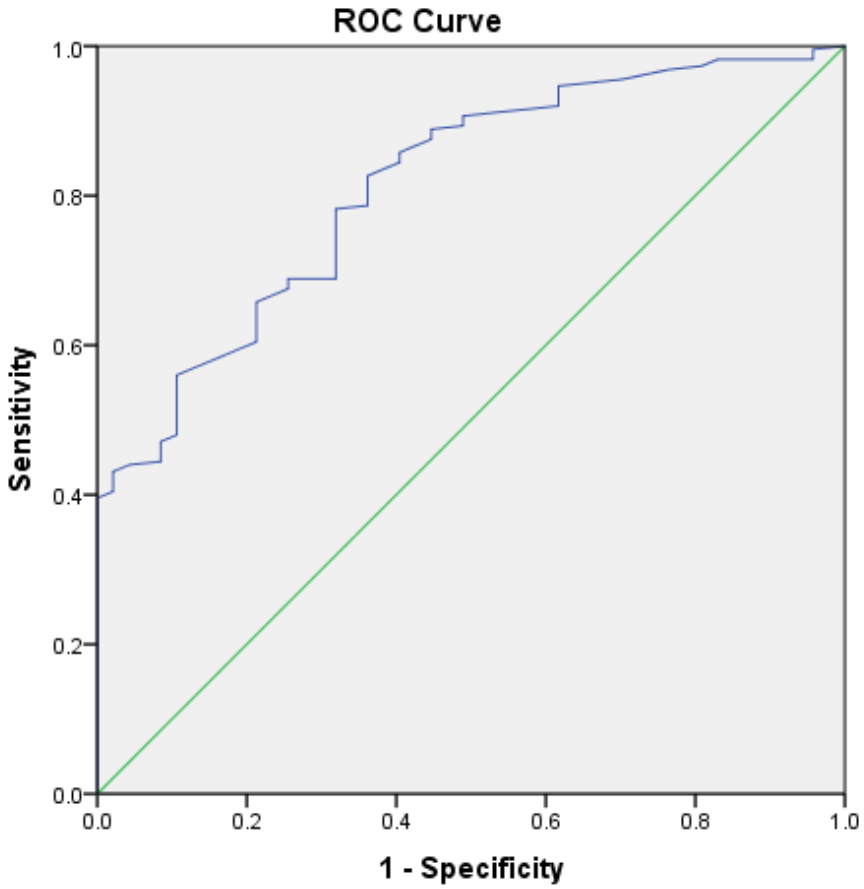

Fig. 2B

Fig. 2A. Area under the receiver operating curve for EVendo score, APRI and (Fig. 2B) Platelet count to splenic diameter for identifying the high risk esophageal varices is 0.852 (p-value <0.001), 0.835(<0.001) and 0.814(p<0.001) respectively

Table 2. Performance of EVendo score in predicting the presence of Esophageal Varices (EVs) and also in identifying high risk EVs (HRVs)

EVendo score	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Diagnostic accuracy
For Presence if EVs Cut off >7.3	94.92%	80.52%	78.87%	95.38%	86.76%
For identifying HRVs Cutoff >8	87.23%	83.56%	53.46%	96.91%	84.19%

Dong et al. [11] proposed and validated EVendo score in American population as a non-invasive assessment tool for the detection of EVs and also for the prediction of HRVs. It was based on the variables; platelet count, ascites, international normalized ratio (INR), Aspartate Transaminase (AST), hemoglobin and Blood Urea Nitrogen (BUN). Low platelet count and ascites reflects the presence of portal hypertension and increased INR and AST are associated with advanced liver fibrosis [19-21]. Similarly, low hemoglobin levels might be due to portal hypertensive gastropathy in cirrhotic patients while decreased BUN reflects decreased urea synthesis due to impaired liver function. In the study done by Dong and his colleagues [11], EVendo score <3.90 was effective in ruling out EVs and HRVs with a sensitivity of approximately 92.3% and 100% respectively and specificity of around 66% for ruling out EVs and 49% for

HRVs respectively. Our study was comparable to the study done by Dong et al. [11] as the prevalence of EVs was less than 50% in both the population. We took a higher cutoff of >7.3 in our population using the AUROC and it had an excellent sensitivity of 94.92% and negative predictive value of 95.38% along with good diagnostic accuracy of 86.76% in predicting EVs.

While predicting HRVs, a slightly higher cutoff of >8 was taken using the AUROC which showed an excellent sensitivity of 87.23%,specificity of 83.56%, negative predictive value of 96.91% and diagnostic accuracy of 84.19%.

While comparing this score with other coexisting non-invasive assessment tools such as APRI and Platelet count to splenic diameter, the diagnostic accuracy was highest for EVENDO score both for the prediction of the presence of EVs and also for the HRVs.

There were certain limitations to our study. At first, it was a single centered study. Secondly, the small sample size of the study was another weakness as the studies with large sample sizes are needed to be performed to make this score generally applicable.

There were few strengths that can be attributed to this study. First of all, it was a prospective study. Secondly, it was a pioneer study regarding the utility of EVendo score in South-east Asian population. One of the strengths of this study also was the comparison of this score with other coexisting non-invasive assessment tools in predicting the presence of EVs and also HRVs.

5. CONCLUSION

The performance of EVendo score was reliable and better than the other non-invasive scores in predicting EVs in our population with an excellent sensitivity and diagnostic accuracy in predicting the EVs and also in identifying HRVs. However, studies comprising larger sample sizes are required in this regard.

CONSENT

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Rigo GP, Merighi A, Chahin NJ, et al. A prospective study of the ability of three endoscopic classifications to predict hemorrhage from esophageal varices. Gastrointest Endosc. 1992;38:425–429.
2. Garcia-Tsao G, Abraldes JG, Berzigotti A, et al. Portal hypertensive bleeding in cirrhosis: risk stratification, diagnosis, and management: 2016 practice guidance by the American Association for the Study of Liver Diseases. Hepatology 2017;65:310–335.
3. Mallet M, Rudler M, Thabut D. Variceal bleeding in cirrhotic patients. Gastroenterol Rep (Oxf) 2017;5:185–92.
4. Kim BK, Han KH, et al. A liver stiffness measurement-based, noninvasive prediction model for high-risk esophageal varices in B-viral liver cirrhosis. Am J Gastroenterol. 2010;105:1382–90.
5. Correia LM, Bonilha DQ, Gomes GF, et al. Sedation during upper GI endoscopy in cirrhotic outpatients: a randomized, controlled trial comparing propofol and fentanyl with midazolam and fentanyl. Gastrointest Endosc. 2011;73:45–51.
6. de Franchis R, Baveno VI faculty. Expanding consensus in portal hypertension: Report of the baveno VI consensus workshop: Stratifying risk and individualizing care for portal hypertension. J Hepatol. 2015;63:743–752.
7. Sousa M, Fernandes S, Proença L, et al. The baveno VI criteria for predicting esophageal varices: validation in real life practice. Rev Esp Enferm Dig. 2017;109:704–707.
8. Colli A, Gana JC, Yap J, et al. Platelet count, spleen length, and platelet count-to-spleen length ratio for the diagnosis of esophageal varices in people with chronic liver disease or portal vein thrombosis. Cochrane Database Syst Rev. 2017; 4:CD008759.
9. Hanafy AS, Badawi R, Basha MAA, Selim A, Yousef M, Elnawasany S, Mansour L, Elkhouly RA, Hawash N, Abd-Elsalam S. A novel scoring system for prediction of esophageal varices in critically ill patients. Clin Exp Gastroenterol. 2017;10:315-325.

10. Khan RTY. Bedside utility of liaoning score a non-invasive as predictor of esophageal varices in hepatitis C associated chronic liver disease in Pakistani population. Clin Onco. 2022;6(9):1-6
11. Dong TS, Kalani A, Aby ES, Le L, Luu K, Hauer M, Kamath R, Lindor KD, Tabibian JH. Machine learning-based development and validation of a scoring system for screening high-risk esophageal varices. Clinical Gastroenterology and Hepatology, 2019;17(9):1894-1901.
Available:https://doi.org/10.1016/j.cgh.2019.01.025
12. Alswat K, Alanazi M, Bashmail A, Alkhamash M, Alqahtani SA, Al-Hamoudi W, Abdo AA. Validation of the EVendo score for the prediction of varices in cirrhotic patients. Saudi J Gastroenterol. 2022;28(5):378-384.
DOI: 10.4103/sjg.sjg_624_21.
PMID: 35229755; PMCID: PMC9752538
13. Korula J. Platelet count/spleen diameter ratio predicted the presence of esophageal varices in liver cirrhosis. ACP J Club. 2004;140(2):53.
14. Idezuki Y. General rules for recording endoscopic findings of esophagogastric varices (1991). Japanese Society for Portal Hypertension. World J Surg 1995;19:420-422.
15. Stefanescu H, Grigorescu M, Lupsor M, Procopet B, Maniu A, Badea R. Spleen stiffness measurement using Fibroscan for the noninvasive assessment of esophageal varices in liver cirrhosis patients. J GastroenterolHepatol. 2011;26(1):164-70.
16. Baig WW, Nagaraja MV, Varma M, et al. Platelet count to spleen diameter ratio for the diagnosis of esophageal varices: Is it feasible? Can J Gastroenterol 2008; 22:825–828.
17. Chalasani N, Imperiale TF, Ismail A, et al. Predictors of large esophageal varices in patients with cirrhosis. Am J Gastroenterol 1999;94:3285–3291.
18. Stafylidou M, Paschos P, Katsoula A, Malandris K, Ioakim K, Bekiari E, et al. Performance of Baveno VI and expanded Baveno VI criteria for excluding high-risk varices in patients with chronic liver diseases: A systematic review and meta-analysis. Clin Gastroenterol Hepatol 2019;17:1744-55.e11
19. Suk KT. Hepatic venous pressure gradient: clinical use in chronic liver disease. Clin Mol Hepatol 2014;20:6–14.
20. Kamath PS, Wiesner RH, Malinchoc M, et al. A model to predict survival in patients with end-stage liver disease. Hepatology 2001;33:464–470.
21. Sterling RK, Lissen E, Clumeck N, et al. Development of a simple noninvasive index to predict significant fibrosis in patients with HIV/HCV coinfection. Hepatology 2006;43:1317–1325.

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