

Research Article**Validation of the EVendo Score for Prediction of Esophageal Varices in Patients with Liver Cirrhosis: A Prospective Cross-Sectional Study****Dr Shashikanth Patil¹, Dr Sneha Bharathi S Angadi², Dr. Shivaprasad Gaddikeri³**¹(MD General Medicine), senior resident General Medicine, Rajiv Gandhi Super specialty Hospital (OPEC) Raichur. (A unit of Rims, Raichur)²(MD Dermatology), Assistant Professor, Raichur institute of medical sciences, Raichur.³(MD General Medicine) Senior Resident, Dept of Cardiology Sanjay Gandhi Postgraduate Institute Of Medical Sciences**Corresponding Author: Dr Shashikanth Patil****Accepted Date: 27 May 2026****Abstract**

Background: Esophageal varices are a common complication of portal hypertension in patients with liver cirrhosis and are associated with potentially life-threatening variceal hemorrhage. Upper gastrointestinal endoscopy is still an important modality for variceal detection, but repeated endoscopic screening may be resource intensive. Thus, several non-invasive prediction models have been developed to identify patients with lower or higher probability of having varices. The EVendo score is composed of routinely available laboratory parameters and the presence of ascites and may represent a practical approach to risk stratification. [1–4]

Objective: To assess the efficacy of the EVendo score in predicting esophageal varices in patients with liver cirrhosis.

Methods: The prospective cross-sectional hospital based study was conducted for a period of 18 months from January 2022 to June 2023 in the department of general medicine, Navodaya medical college and research center, raichur. One hundred patients aged 18–60 years with liver cirrhosis and portal hypertension were recruited by simple random sampling. Clinical examination, laboratory tests, abdominal ultrasonography and upper gastrointestinal endoscopy were performed. The EVendo score was based on hemoglobin, platelet count, blood urea nitrogen, aspartate aminotransferase, international normalized ratio and ascites. A score >3.90 was a positive predictor for esophageal varices. The reference outcome was endoscopic diagnosis of esophageal varices. We

calculated sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) to assess diagnostic performance.

Results: The mean age of the participants was 48.17 ± 5.40 years and 79% were males. Esophageal varices were found in 50 % of the patients. The mean EVendo score for the total cohort was 4.62 ± 1.07 . Among the patients, 72% scored >3.90 and 28% scored <3.90 . Mean EVendo score was significantly higher in subjects with esophageal varices compared to subjects without varices (4.91 ± 1.13 vs 4.33 ± 0.91 ; $p=0.0057$). At the cut-off of >3.90 , the EVendo score correctly identified 38/50 patients with esophageal varices and 16/50 patients without varices. Sensitivity was 76%, specificity 32%, PPV 52.78% and NPV 57.14%.

Conclusion: In this hospital-based cohort of patients with liver cirrhosis, the EVendo score was significantly higher in patients with endoscopically detected esophageal varices. The score showed moderate sensitivity and poor specificity at a cutoff >3.90 . The EVendo score may help to risk-stratify in a non-invasive way, but its relatively low specificity and NPV in this cohort suggests that it should not be used as a replacement for endoscopic assessment without further validation.

Keywords: liver cirrhosis; esophageal varices; EVendo score; portal hypertension; non-invasive prediction; endoscopy; diagnostic accuracy.

Introduction

Liver cirrhosis is characterized by progressive distortion of hepatic architecture, portal hypertension and impaired hepatic function. Portal hypertension is the cause of several major

complications of cirrhosis, namely gastroesophageal varices, ascites, splenomegaly and hepatic encephalopathy. Esophageal varices are portosystemic collateral vessels that develop in response to elevated portal pressure and can bleed, causing significant morbidity and mortality. [1,2]

An important component of the assessment of patients with cirrhosis is screening for esophageal varices. Upper gastrointestinal endoscopy allows direct visualization of the esophagus and is a well established method for detecting varices and identifying patients who may need prophylactic intervention. However, universal and repeated endoscopic surveillance can augment healthcare utilization, cost and procedural burden. Consequently, there has been increasing interest in non-invasive means of identifying patients unlikely to have clinically important varices. [3,4]

Several non-invasive scores have been evaluated using routinely available clinical, hematological and biochemical parameters. The EVendo score was derived by machine learning and incorporates international normalized ratio (INR), aspartate aminotransferase (AST), platelet count, blood urea nitrogen (BUN), hemoglobin and presence of ascites. Its main advantage is that the required variables are generally available during routine evaluation of patients with cirrhosis. [3]

Previous studies have shown promising diagnostic performance of EVendo score. The sensitivity and specificity of the score in different populations have been variable in external validation studies, highlighting the need for validation of the score in independent patient populations. [5,6] In a Pakistani cohort EVendo had an area under the receiver operating characteristic curve of 0.93 for prediction of esophageal varices, while another validation study reported a sensitivity of 82% and specificity of 57% for gastroesophageal varices at the relevant threshold. [5,6]

Despite these findings, differences in patient characteristics, disease etiology and severity may affect the performance of non-invasive prediction models. The current study, therefore, aimed to evaluate the performance of the EVendo score in comparison with endoscopically detected esophageal varices in a hospital-based cohort of liver cirrhosis patients.

Objective

The primary objective was to assess the ability of the EVendo score, using a cutoff of >3.90 , to predict the presence of esophageal varices in patients with liver cirrhosis.

Materials and Methods

Study design and setting

This study was a **hospital-based prospective cross-sectional study** conducted in the Department of General Medicine, Navodaya Medical College and Research Centre, Raichur, Karnataka, India.

The study was conducted over **18 months, from January 2022 to June 2023**.

Study population

Patients attending the General Medicine outpatient department or admitted to the General Medicine wards with a clinical diagnosis of liver cirrhosis were screened for eligibility.

Inclusion criteria

Participants were eligible if they:

1. Were aged 18–60 years.
2. Had liver cirrhosis with portal hypertension.

Exclusion criteria

Patients were excluded if they:

- declined participation;
- were younger than 18 years or older than 60 years;
- had hepatocellular carcinoma detected by ultrasonography;
- were pregnant;
- had primary hematological disorders; or
- had a previous surgical intervention for portal hypertension.

Sampling and sample size

Simple random sampling was used. The original sample-size calculation was based on a reported EVendo sensitivity of 94.92% at a previously studied cutoff, with a 5% relative error and 20% allowance for non-response. The calculated sample size was 98, and the final sample was rounded to **100 participants**.

Data collection

After obtaining written informed consent, participants underwent clinical examination and collection of demographic and clinical information using a pre-structured questionnaire. Information regarding presenting symptoms, habits, comorbidities and previous blood transfusion or blood-product exposure was recorded. Venous blood samples were analyzed in the institutional laboratory

The investigations included:

- complete blood count;
- coagulation profile;
- liver function tests;
- renal function tests;
- viral markers including HBsAg, HIV and HCV;
- abdominal and pelvic ultrasonography;
- upper gastrointestinal endoscopy; and
- random blood glucose.

EVendo score

The EVendo score was calculated from routinely available laboratory variables and ascites status using the formula reported in the Study:

$$\text{EVendo score} = \frac{(8.5 \times \text{INR}) + (\text{AST}/35)}{(\text{Platelets}/150) + (\text{BUN}/20) + (\text{Hemoglobin}/15)} + 1$$

where platelet count is expressed in ($10^9/\text{L}$), BUN in the corresponding conventional units used for the score, hemoglobin in g/dL and AST in U/L. One additional point was assigned for the presence of ascites.

For the present analysis, an EVendo score >3.90 was classified as a positive prediction for esophageal varices, whereas a score <3.90 was classified as a negative prediction. The Study reports this threshold as the basis for the diagnostic-performance analysis.

Reference standard

Upper gastrointestinal endoscopy was performed as part of the clinical evaluation. Endoscopic identification of esophageal varices was used as the reference outcome against which the EVendo score was evaluated.

The study population was subsequently classified into:

- **Varices present:** 50 patients
- **Varices absent:** 50 patients.

Statistical analysis

Data were coded and entered into Microsoft Excel and a master chart was prepared. Continuous variables were summarized using mean and standard deviation, while categorical variables were presented as frequencies and percentages. The original Study reports use of the *t* test, chi-square test and ANOVA, with statistical significance defined as $p < 0.05$. EPI software was used for statistical analysis.

For this manuscript, EVendo performance was summarized using:

- sensitivity;
- specificity;
- positive predictive value; and

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- negative predictive value.

These measures were calculated from the 2×2 contingency table using endoscopic variceal status as the reference outcome.

Ethical considerations

Results

Participant characteristics

Table 1. Baseline demographic characteristics

Characteristic	n	%
Age		
<40 years	5	5
41–50 years	63	63
>51 years	32	32
Sex		
Male	79	79
Female	21	21
Total	100	100

Mean age: 48.17 ± 5.40 years

Etiology and clinical profile

Alcohol-related liver disease was the most frequently recorded etiology in the Study (72%), followed by hepatitis B (14%), NAFLD (14%) and hepatitis C (7%).

Among the recorded clinical features, anorexia was reported in all participants, followed by abdominal pain (95%), jaundice (84%), vomiting (83%), pedal edema (58%), altered sensorium (34%), abdominal distension (30%) and fever (15%).

For the present EVendo-focused manuscript, these variables are presented as baseline characteristics rather than primary outcomes.

EVendo score distribution

The mean EVendo score for the study population was 4.62 ± 1.07 .

Overall, 72% of participants had an EVendo score >3.90, whereas 28% had a score <3.90.

Table 2. Distribution according to EVendo score

EVendo score category	n	%
<3.90	28	28
>3.90	72	72
Total	100	100

Mean EVendo score: 4.62 ± 1.07

A total of **100 patients** with liver cirrhosis and portal hypertension were included.

The mean age was **48.17 ± 5.40 years**. Most participants were aged 41–50 years (63%), while 32% were aged >51 years and 5% were aged <40 years. Men constituted 79% of the cohort and women 21%.

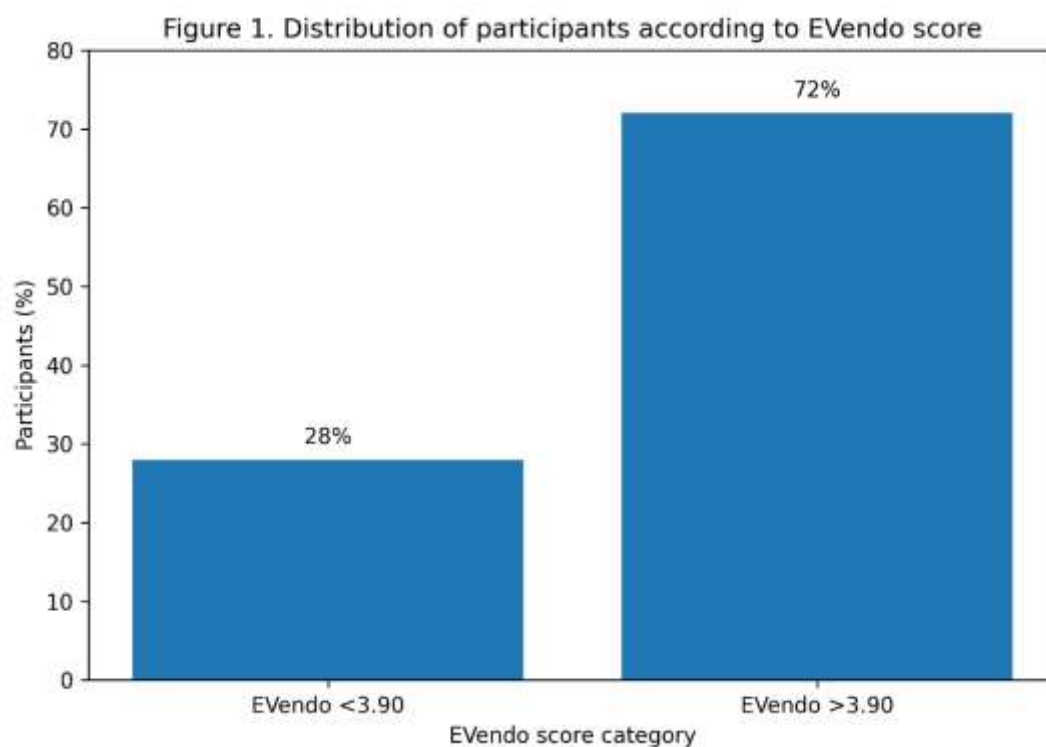


Figure 1. Distribution of participants according to EVendo score category.

Bar chart showing the proportion of participants with EVendo score <3.90 (28%) and >3.90 (72%).

Endoscopic presence of esophageal varices

Endoscopic evaluation identified esophageal varices in **50 of 100 participants (50%)**, while 50 participants (50%) had no esophageal varices.

Table 3. Presence of esophageal varices

Endoscopic finding	n	%
Esophageal varices present	50	50
Esophageal varices absent	50	50
Total	100	100

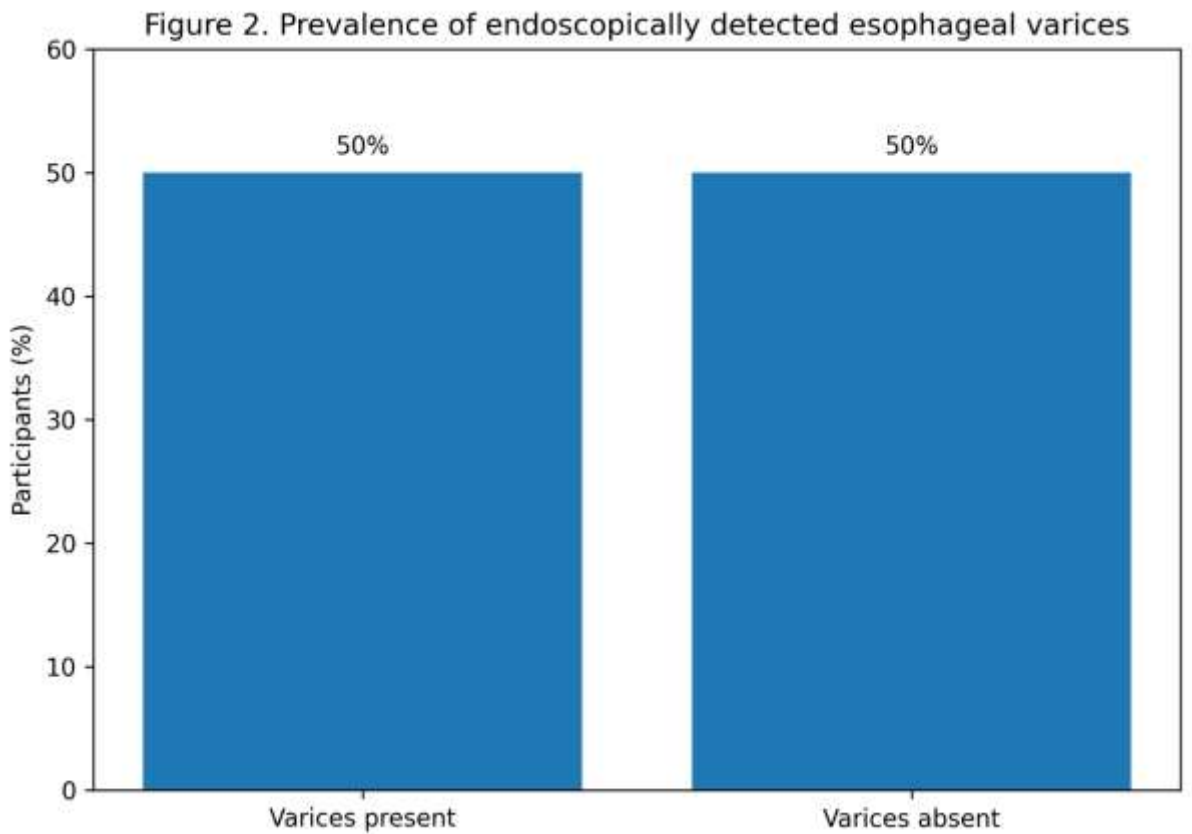


Figure 2. Prevalence of endoscopically detected esophageal varices in the study cohort.
Pie chart or bar chart showing equal distribution of participants with and without esophageal varices (50% each).

EVendo score according to variceal status

The mean EVendo score was significantly higher in participants with esophageal varices than in those without varices.

Participants with varices had a mean EVendo score of **4.91 ± 1.13**, compared with **4.33 ± 0.91** among participants without varices. The difference was statistically significant ($t=2.8267$, $p=0.0057$).

Table 4. Comparison of EVendo score according to esophageal variceal status

Esophageal varices	n	Mean EVendo score	SD
Present	50	4.91	1.13
Absent	50	4.33	0.91
Between-group comparison		t=2.8267	p=0.0057

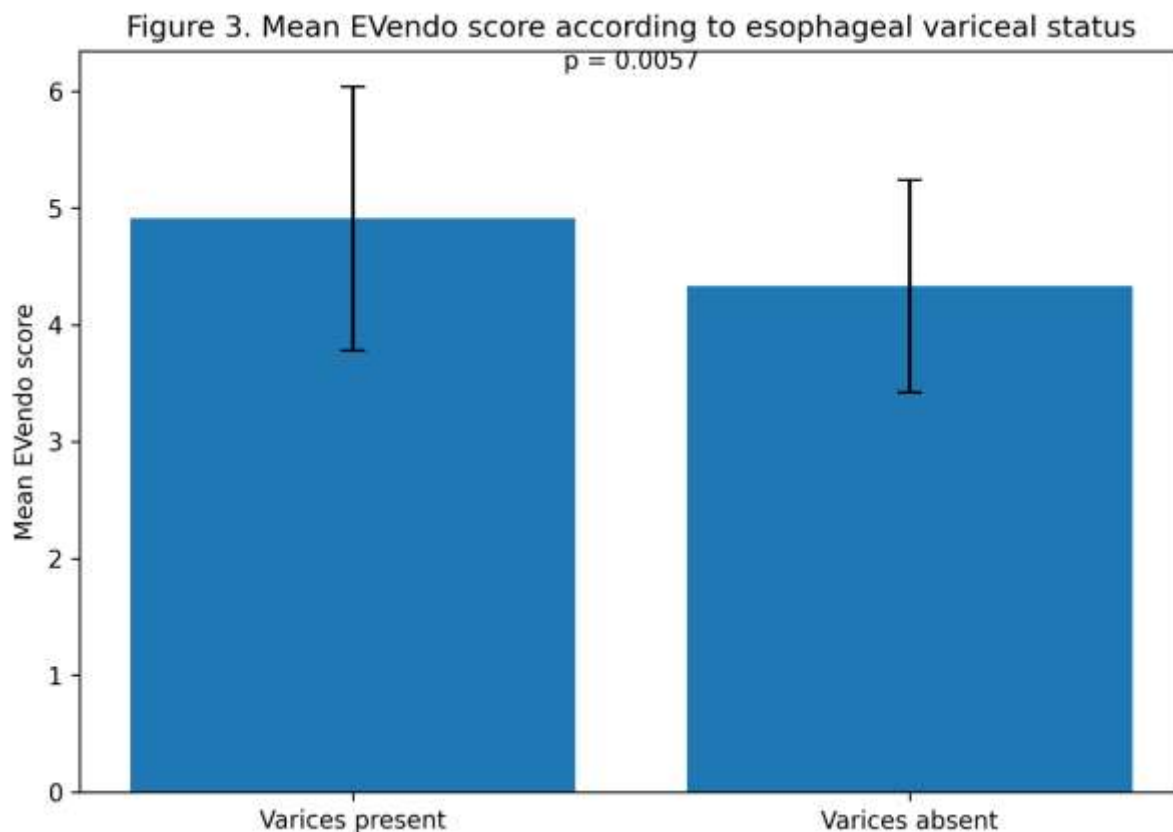


Figure 3. Mean EVendo score according to presence or absence of esophageal varices.
Two-column bar graph comparing mean EVendo score in patients with varices (4.91 ± 1.13) and without varices (4.33 ± 0.91); $p=0.0057$.

Diagnostic Performance of the EVendo Score

At the prespecified threshold of >3.90 , 72 participants were classified as EVendo-positive and 28 as EVendo-negative.

Among the 50 participants with endoscopically confirmed esophageal varices:

- 38 had EVendo >3.90 ;
- 12 had EVendo <3.90 .

Among the 50 participants without esophageal varices:

- 34 had EVendo >3.90 ;
- 16 had EVendo <3.90 .

Table 5. 2×2 contingency table for EVendo score and esophageal varices

EVendo classification	Varices present	Varices absent	Total
Positive (>3.90)	38	34	72
Negative (<3.90)	12	16	28
Total	50	50	100

Table 6. Diagnostic performance of EVendo score at >3.90

Diagnostic parameter	Result
Sensitivity	76.0%
Specificity	32.0%
Positive predictive value	52.78%
Negative predictive value	57.14%
True positives	38
False positives	34
True negatives	16
False negatives	12

The sensitivity of 76% indicates that the EVendo threshold identified approximately three-quarters of participants with endoscopically detected varices. However, the specificity was only 32%, reflecting a substantial number of false-positive classifications. The PPV was 52.78%, while the NPV was 57.14%.

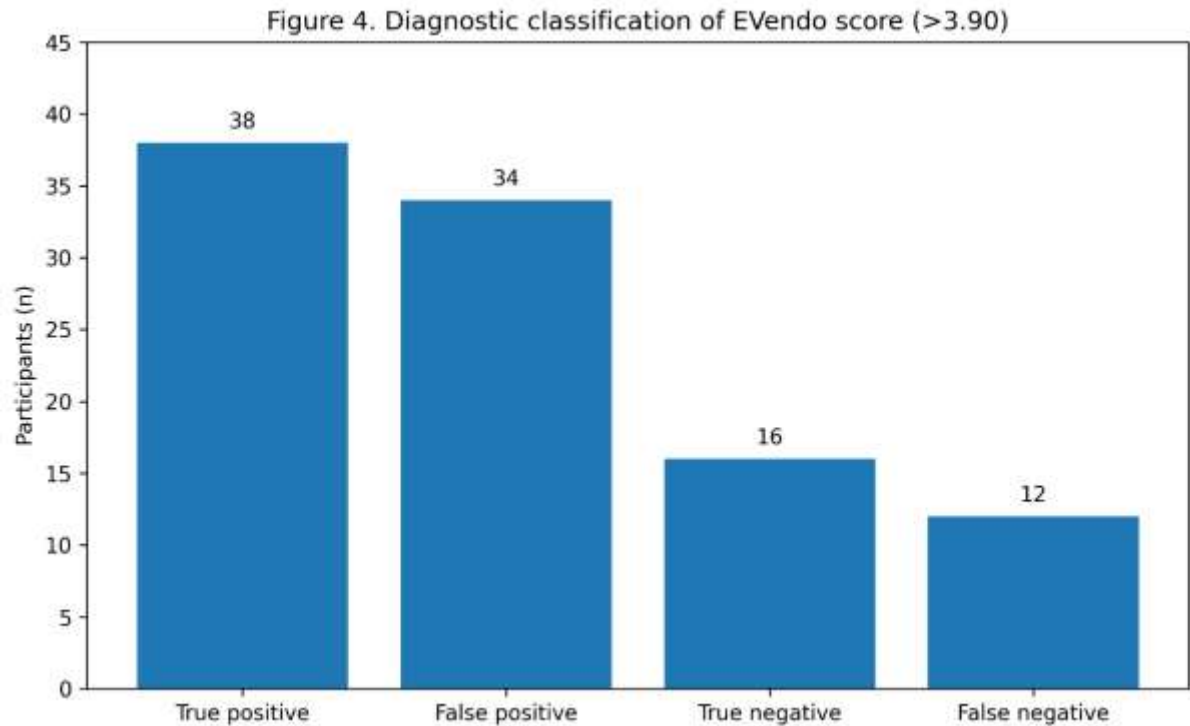


Figure 4. Diagnostic classification of EVendo score at a cutoff of >3.90.

Stacked or grouped bar chart demonstrating true-positive (38), false-positive (34), true-negative (16) and false-negative (12) classifications.

Discussion:

In the present study, the performance of the EVendo score was assessed in 100 patients with liver cirrhosis and portal hypertension, using endoscopic detection of esophageal varices as the reference outcome. Esophageal varices were found in 50% of the study population. The main result was a significantly higher average EVendo score in patients with esophageal varices than in patients

without varices. However, at the cutoff of >3.90, the score showed the sensitivity of 76% and specificity of 32% with PPV of 52.78% and NPV of 57.14%. Clinical relevance of non-invasive prediction of esophageal varices is based on the need to balance the adequate identification of patients at risk with unnecessary endoscopic procedures. This has led to considerable interest in non-invasive models based on routinely available parameters, particularly when

repeated endoscopic surveillance is difficult or resource-intensive. [3,4]

The interest in the EVendo score is that it is very attractive in that it combines laboratory measures reflecting several physiological consequences of advanced liver disease including thrombocytopenia, impaired synthetic function and biochemical abnormalities, together with ascites. The original formulation uses INR, AST, platelet count, BUN and hemoglobin with an extra point for ascites.

In our current cohort, the average EVendo score was 4.62 ± 1.07 . The mean score was significantly higher in participants with esophageal varices compared to participants without varices (4.91 ± 1.13 vs 4.33 ± 0.91 ; $p=0.0057$). This result is consistent with the biological and clinical plausibility of the score: patients with more severe alterations in the variables included in EVendo were more likely to have varices related to portal hypertension.

However, the diagnostic-performance results did not perform as well as reported in some external cohorts. In a study of 272 patients with cirrhosis in Pakistan, Jan et al. reported the AUROC of 0.93 for EVendo in predicting esophageal varices with a diagnostic accuracy of 86.76%. [6] The authors concluded that EVendo performed reliably in their population, but also called for larger studies. (Journal Jammr)

In the same vein, Alswat et al. externally validated the EVendo in cirrhotic patients and demonstrated sensitivity of approximately 82% and specificity of 57% for the gastroesophageal varices at the evaluated cut-off. Their study found that EVendo could be a useful screening tool, but its performance varied according to the clinical setting. (PubMed Central (PMC))

The lower specificity found in this study is clinically important. Among the 50 patients without endoscopically detected varices, 34 had EVendo scores >3.90 and were therefore classified as positive. The score detected a high rate of patients with varices, but it also classified many patients without varices as potentially positive. This limits its utility as an isolated strategy to avoid endoscopy in this particular cohort.

It is also worth highlighting the relatively modest NPV of 57.14%. Ideally, a non-invasive score primarily aimed at excluding patients from endoscopic surveillance would have a sufficiently high sensitivity and NPV to minimize missed clinically important varices. In this cohort, 12 of 50 patients with endoscopically confirmed varices had EVendo scores below the selected cut-off. Therefore,

an EVendo score of less than 3.90 could not reliably rule out varices in this study population.

Differences between studies may be due to differences in patient selection, severity of cirrhosis, etiology of disease, prevalence of varices and the clinical setting in which endoscopy was performed. The study population included patients with established cirrhosis and portal hypertension, including patients with relatively advanced disease. The Study reported that 46% of participants were in the CTP class B and 20% were in the CTP class C. This case mix may differ from validation cohorts dominated by compensated cirrhosis and may impact on performance of a prediction model.

Current approaches to the evaluation of portal-hypertension are increasingly aimed at non-invasive risk stratification, but these are designed to reduce unnecessary endoscopy in appropriately selected patients, rather than universally replacing endoscopic evaluation. The Baveno VII consensus emphasizes the growing place of non-invasive assessment in clinically relevant portal hypertension while keeping risk-based strategies for variceal management. [7] (PubMed) Our results therefore support the use of EVendo as an adjunctive risk-stratification tool, rather than an independent replacement for endoscopy in this population. The difference in mean score between patients with and without varices was large enough to suggest discrimination, but the low specificity and NPV suggest that additional clinical or non-invasive parameters may be needed before the score can be used with confidence to safely defer endoscopy.

Conclusion

In this prospective hospital-based study of patients with liver cirrhosis and portal hypertension, EVendo score was significantly higher in patients with endoscopically detected esophageal varices than in patients without varices. At a cutoff of >3.90 , the score had 76% sensitivity, 32% specificity, 52.78% PPV and 57.14% NPV.

These results suggest the potential of EVendo for non-invasive risk stratification but showed poor specificity and moderate negative predictive performance in this cohort. Therefore, EVendo should be considered as complementary to clinical evaluation and not as a stand-alone alternative to upper gastrointestinal endoscopy until its performance has been validated in larger, multi-center and etiologically diverse populations.

References

1. de Franchis R, Bosch J, Garcia-Tsao G, Reiberger T, Ripoll C; Baveno VII Faculty. Baveno VII—renewing consensus in portal hypertension. *J Hepatol.* 2022;76(4):959-974. doi:10.1016/j.jhep.2021.12.022. ([PubMed](#))
2. Meseha M, Attia M. Esophageal varices. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; 2023.
3. Bangaru S, Benhammou JN, Tabibian JH. Noninvasive scores for the prediction of esophageal varices and risk stratification in patients with cirrhosis. *World J Hepatol.* 2020;12(11):908-918. doi:10.4254/wjh.v12.i11.908. ([PubMed Central \(PMC\)](#))
4. Lelisa G, Chanie Y, Conjeevaram H, Desalegn H. Non-invasive predictors of esophageal varices in patients with cirrhosis: a cross-sectional study in Ethiopia. *MJH.* 2023;2(2):1-7.
5. Alswat K, Alanazi M, Bashmail A, Alkhamash M, Alqahtani SA, Al-Hamoudi W, et al. 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. ([PubMed Central \(PMC\)](#))
6. Jan M, Khan RTY, Ismail H, Shahzad S, Tasneem AA, Panezai MQ, et al. Utility of EVendo score as a screening tool for the detection of high risk esophageal varices in Pakistani population. *J Adv Med Med Res.* 2023;35(14):105-113. doi:10.9734/jammr/2023/v35i145061. ([Journal Jammr](#))
7. Ismail M. Prediction of high-risk varices in patients with compensated advanced chronic liver disease in Saudi Arabia. *Clin Exp Gastroenterol.* 2023;16:117-127. doi:10.2147/CEG.S410041. ([PubMed Central \(PMC\)](#))