**ORIGINAL ARTICLE**

# Platelet Spleen Index is a Noninvasive Technique to Detect Esophageal Varices in Cirrhotics

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## ABSTRACT

**Background**: noninvasive esophageal parameters may prevent the need for an esophagogastroduodenoscopy. Liver cirrhosis patients may benefit from the PC/SD ratio and the plateletcount to spleen diameter (PC/SD) ratio, both of which are noninvasive yet useful indicators of liver cirrhosis progression.

**Objective:** This study aimed to evaluate the diagnostic accuracy of the platelet spleen index for thediagnosis of gastric varices in patients with cirrhosis, using esophagogastroduodenoscopy as the reference standard.

**Methodology**: A-Cross-sectional descriptive validation The study was conducted over the course of three months, from October, 2019 to December 2019. At the Gastroenterology A tertiary care hospital. The study comprised 90 participants. In addition to the requisite blood tests, abdominal ultrasonography was used to evaluate the size of the spleen. TYPE SIZE The sensitivity is 83%, the specificity is 66%, and the accuracy is 83% Variations were found in 24% of cirrhotic individuals. Cirrhosis was defined inaccordance with the operational definition. Patients' blood samples were collected at the hospital laboratory for a complete blood count, abdominal ultrasound was performed in the Radiology department, and upper GI endoscopy was performed in the endoscopic suite for screeningpurposes.

**Results:** With reverence to study the ages of the study's patients varied from 55.0 to 89.8. Ninety patients (44.7%) were women, while the remaining 48 (55.3%) were males. Hepatitis C was the most common diagnosis (almost 50%), followed by hepatitis B, cryptogenic cirrhosis, and Wilson's disease. Hepatitis A and B accounted for the remaining cases. (1.2% of the total). There were three distinct severity levels for esophageal varices. 12 patients (14.2%), 23 patients (27.7%), 32 patients (37.7%), and38 esophageal varies (21.8%). Out of the total 90, 69.5% were determined to be in Child's Pugh stage A, 24.9% in stage B, and 4.7% in grade C. In a two-by-two table, we calculated the likelihood ratio (sensitivity plus specificity plus positive and negative predictive values) of the platelet spleen index for the diagnosis of gastro esophageal varices, and it came out to 78%. A ROC curve was also generated. Thepatients were stratified according to their age, gender, the cause of their cirrhosis, and the severity of theircondition.

**Practical implications:** This study will provide data to the health care workers to use non-invasive technique to lower procedure costs and associated complications to detect Esophageal varices in cirrhotics

**Conclusion**: It is possible that the amount of unnecessary esophagogastroduodenoscopies may be reduced if a noninvasive method for diagnosing gastroesophageal varices were widely used.

**keywords**: Esophageal varies, Cirrhosis, Platelet spleen index, Non invasive method, esophagogastroduodenoscopy

## INTRODUCTION

Problems like portal hypertension, bleeding, and brain injury are increasingly prevalent as cirrhosis worsens [1]. While the prevalence of cirrhosis is presumed to be high, no reliable data existto support this claim. While the incidence of cirrhosis in the United States is estimated to be 0.27percent, it is estimated to be about 1 percent in Pakistan [2]. Dysphagia, hepatic encephalopathy, ascites, and hypersplenism are all symptoms of cirrhosis, and portal hypertension is the root cause [3.]

Cirrhosis patients have a 24%-60% higher risk of developing esophageal varices, depending on the severity of their condition [4]. Fourteen to fifty-seven percent of cirrhotic patients die from variceal bleeds, with just five to ten percent of those fatalities attributable to the initial bleed itself [5]. Sixth, those with cirrhosis should have a test for esophageal varices and undergo primary prophylaxis with endoscopic variceal band ligation, beta blockers, or both [6, 7]. Medical expenditures have soared as a result of the Baveno and EASL guidelines for screening esophageal varices, especially in countries like Pakistan where advanced medical equipment, such as endoscopy, is not widely available. The future will bring a greater cirrhosis burden due to an increase in the number of cirrhotic patients, more cirrhotic patient awareness, and improved cirrhotic patient survival rates [8]. Noninvasive tests may identify esophageal anomalies [9,10] and help clinicians differentiate between individuals with a high and low risk for complications.

Biomarkers such as the fibrinogen-4 index (alanine aminotransferase/alanine aminotransferase ratio), platelet spleen index (F1), and lok index (lok index) are among these [11, 12]. (King score).There is a considerable amount of international research on the use of the platelet spleen ratio forthe diagnosis of esophageal varices, with cutoff values ranging from 666 to 1400, with a sensitivity of 78% to 0.875% and a specificity of 63%. 76% to 54% [13]. Pakistani citizens have little access to relevant data on this issue. At a threshold value of less than or equal to 909 [14], the platelet-to-spleen ratio for screening varies widely throughout our community.

This study predicted the existence of esophageal varices using the noninvasive and less expensive platelet spleen index[15]. As a result of the 50-60% failure rate of screening endoscopic treatments, Pakistan, a nation with limited resources, would be able to prevent unneeded procedures. This strategy has the potential to lower procedure costs and associated complications.

## METHODOLOGY

A-Cross-sectional descriptive validation The study was conducted over the course of three months, from October, 2019 to December 2019. At the Gastroenterology A tertiary care hospital. The study comprised 90 participants. In addition to the requisite blood tests, abdominal ultrasonography was used to evaluate the size of the spleen. TYPE SIZE The sensitivity is 83%, the specificity is 66%, and the accuracy is 83% Variations were found in 24% of cirrhotic individuals.

**Process for Gathering Information:** One hundred seventy patients who satisfied the inclusion criteria were enrolled in the study aftergiving their informed consent and getting the OK from the ethical committee. Comprehensive demographic information, study variables, and results from necessary diagnostic tests such a complete blood count and an ultrasound to measure the size of the spleen were gathered. The operational concept of cirrhosis was used to define the disease. Data were collected and entered into a

structured questionnaire by the researcher (Attached). Screening procedures that involved collecting blood samples from patients ranged from complete blood counts to ultrasounds of the abdomen to endoscopies of the upper gastrointestinal tract.

**Data Analysis Procedure:** The data was entered and analysed using SPSS version 2.4. Age, platelet count, and spleen size were only few of the numerical variables that were averaged and standard deviations were determined for. Quantitative parameters including gender, cirrhosis aetiology, and esophageal grading were represented as percentages and frequencies. Following stratification by age, gender, cause, stage, and grade of cirrhosis, diagnosis accuracy was assessed using 2x2 tables. For this study, we calculated the ROC and the likelihood ratio (LRR).

## RESULTS

From October 2019 until December 2019, 90 patients were enrolled in the trial, with a mean age of 55.0 (9.8) years. ninety-patients (44.7%) were women, while the remaining 94 (55.3%) were males. Hepatitis C was present in 72 of the patients, hepatitis B in 10, non-cryptogenic cirrhosis in 8, and Wilson's disease in 2. (1.2 percent ). 12 patients (14.2%), 23 patients (27.7%), 33 patients (37.7%), and 18 esophageal varies (21.8%) were determined to have grade I, II, or III esophageal varicosities, respectively. Out of the total, 69.5% were determined to be in Child's Pugh stage A, 24.9% in stage B, and 4.7% in grade C. This research employed a two-by-two table to assess the reliability of the platelet spleen index as a diagnostic tool for spotting esophageal varices. In general, these tests showed a high degree of diagnostic accuracy, with a sensitivity of 73.6%, specificity of 100%, a chance of success of 100%, a probability of failure of 51.3%, and a likelihood ratio of 78.3%. The ROC curve was also constructed. Age, gender, the underlying cause of cirrhosis, and the severity of the disease all had a role in the group's stratification.

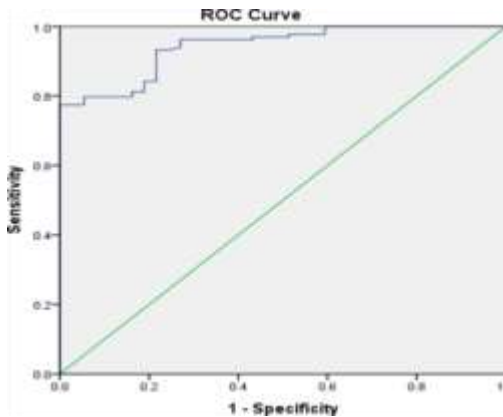We'll have a group discussion about it, and then make a decision.



Figure 1: The platelet count has a distinct ROC Curve.

Receiver operating characteristic curve for the platelet count/diameter of the spleen ratio independent of esophageal varies

Table-1: Distribution Of Patients By Age And Percentage %

| Age (Year) | Number | Percentage |
|---|---|---|
| 21-50 | 28.5 | 33.5 |
| 51-70 | 56.5 | 66.5 |
| Total | 90 | 100.0 |
| Mean±SD | 55.0±9.8 | |

Table-2: Distribution Of Patients By Gender %

| Gender | Number | Percentage |
|---|---|---|
| Male | 47 | 55.3 |
| Female | 38 | 44.7 |
| Total | 90 | 100.0 |

Table-3: Causes Of Cirrhosis

| Causes | Number | Percentage |
|---|---|---|
| Hepatitis B | 10 | 11.8 |
| Hepatitis C | 70 | 83.5 |
| Wilson's disease | 5 | 1.2 |
| Non-cryptogenic cirrhosis | 5 | 4.7 |
| | 90 | 100.0 |

Total is not 100% as there were some multiple responses

Table-4: Stage of cirrhosis

| Child's Pugh Stage | Number | Percentage |
|---|---|---|
| Stage A | 60 | 69.4 |
| Stage B | 20 | 25.9 |
| Stage C | 10 | 04.7 |
| Total | 90 | 100.0 |

Table-4: During using video endoscopy to diagnose esophageal varices, the platelet spleen index has high diagnostic accuracy.

| Platelet spleen index | Video Endoscopy (Gold Standard) | | Total |
|---|---|---|---|
| | Positive | Negative | |
| Positive | 98 (TP) a | 0 (FP) b | 50 |
| Negative | 35 (FN) c | 37 (TN) d | 40 |
| Total | 133 a+c | 37 b+d | 90 |

Diagnostic accuracy: a+d/a+d+b+c x 100 79.4 percent; Specificity: d/d+b x 100 100%; Positive Predictive Value: a/a+b x 100 100%; Negative Predictive Value: d /c+d x 100 51.3 percent; Likelihood ratio: 78.3 percent.

Table-5: age-based classification (21-50 year) When used as the gold standard, video endoscopy has the highest diagnostic accuracies for esophageal varices.

| Platelet spleen index | Video Endoscopy (Gold Standard) | | Total |
|---|---|---|---|
| | Positive | Negative | |
| Positive | 36 (TP) a | 0 (FP) b | 18 |
| Negative | 8 (FN) c | 13 (TN) d | 11 |
| Total | 44 a+c | 13 b+d | 29 |

age stratification (21-50 year) With video endoscopy serving as the gold standard, the platelet spleen index's diagnostic precision for esophageal varices A/A+C x 100 81.2 percent was the sensitivity. The specificity was d/d+b x 100 %. A/A+B x 100 = 100% Positive Predictive Value d/c+d x 100 negative predictive value 61.9 percentage 85.9% of diagnoses are accurate (a+d/a+d+b+c x 100). 33.3 percent likelihood ratio

Table-6: Female Stratification Video endoscopy is the gold standard for diagnosing platelet spleen index for esophageal variabilities.

| Platelet spleen index | Video Endoscopy (Gold Standard) | | Total |
|---|---|---|---|
| | Positive | Negative | |
| Positive | 44 (TP) a | 0 (FP) b | 44 |
| Negative | 12 (FN) c | 20 (TN) d | 32 |
| Total | 56 a+c | 20 b+d | 76 |

Table-7: Stratification for Child Pugh C (Stage of cirrhosis) Diagnostic accuracy of platelet spleen index for esophageal varies taking video endoscopy as gold standard3

| Platelet spleen index | Video Endoscopy (Gold Standard) | | Total |
|---|---|---|---|
| | Positive | Negative | |
| Positive | 6 (TP) a | 0 (FP) b | 6 |
| Negative | 2 (FN) c | 1 (TN) d | 3 |
| Total | 8 a+c | 1 b+d | 9 |

Diagnostic accuracy: a+d/a+d+b+c x 100 84.2 percent; Sensitivity: a/a+c x 100 78.5 percent; Specificity: d/d+b x 100 100 percent; Positive Predictive Value: a/a+b x 100 100 percent; Negative Predictive Value: d/c+d x 100 62.5 percent; Likelihood ratio: 45.2 percent.

Sensitivity :a/a+c x 100 75.0%,Specificity :d/d+b x 100 100%,Positive Predictive Value a/a+b x 100 100%,Negative Predictive Value: d/c+d x 10033.3%, Diagnostic accuracy a+d/a+d+b+c x 100 77.7% Likelihood ratio 2.2%

## DISCUSSION

New guidelines affirm that esophagogastroduodenoscopy is still the best method for diagnosing esophageal problems. For whatever reason, esophagogastroduodenoscopy is not often used in developing countries [16].

Eosinophilic esophagitis has a reported prevalence range of 24–80 percent [17.] Non-invasive methods for predicting esophageal anomalies would limit endoscopic tests to individuals at high risk [18]. There was a dearth of data in this field before the year 2000. All cirrhotic patients, however, should undergo endoscopic evaluation for anomalies, as per the recommendations of a recent consensus on the criteria, methodology, and treatment modalities in portal hypertension. Previous studies have shown that there are noninvasive approaches to determine who is at low risk and so may safely forego an endoscopy [19]. Twenty studies have shown conflicting results about the factors that predict variation; this is likely because to the wide variety of study populations and illnesses. This complicates attempts to develop a single, broad-reaching model of prediction [20].

A ratio of platelet count to spleen diameter was proposed by Giannini and coworkers to help forecast fluctuations. For the noninvasive assessment of varices, the PC/SD ratio seems to meet rigorous methodological and pathologic standards. The diagnostic accuracy of this parameter was confirmed by endoscopic diagnosis in those who did not have esophageal varices [21]. The PC/SD ratio has shown promise as a noninvasive predictor of esophageal varices in cirrhotic patients. Portal hypertensive patients may find therapeutic use in this ratio [22]. While the PC/SD ratio may help stratify cirrhotic patients into risk categories, the data presented here do not warrant abandoning upper gastrointestinal endoscopy for the diagnosis of esophageal abnormalities. This may help reduce the need for endoscopies in people whose conditions prevent them from undergoing an invasive examination but whose medical history suggests that they may have esophageal varices [23]. Maximum spleen size (in millimetres) and the PC were the two noninvasive predictors in this study. Using these two variables, we were able to get the PC/SD24 ratio. The specificity of 909 was 100% and the sensitivity was 73%. Recent data from a meta-analysis of 1275 patients shows a sensitivity of 89% and a specificity of 74% [24]. Methods that are simple, dependable, and painless to get are preferred. Since people with hepatic cirrhosis are a frequent target for these kinds of tests, there is no additional financial burden associated with them [25]. The test had a positive predictive value (the proportion of patients who really had the disease) of 100%, but the negative predictive value was only 51.3%. Easier and more affordable testing for esophageal anomalies in patients with portal hypertension may be developed with the use of the PC/SD ratio. In order to acquire an accurate profile and prevent endoscopy in patients who do not have esophageal varices, the ideal equipment should have high sensitivity and specificity as close to 100% as possible. The PC/SD ratio may be used to identify those who are at high risk for developing esophageal varices [26].

## CONCLUSION

The platelet spleen index is a potential effective noninvasive approach for detecting individuals who have esophageal varices. This index has the potential to cut down on the number of needless endoscopies that are performed.

## REFERENCES

1. Scagline S, Kiethermes S, Cao G, Shoham D, Durazo R, Luke A, at al. The epidemiology of cirrhosis in united states. J Clin Gastroenterol 2015;49:690-6.
2. Shah MA, Mashia SA, Younus MF, Ghauri A, Ejaz R, Alshalabi H, Kakar IK, Umar M. Hepatic cirrhosis-disease burden. JRMC 2015;19:17-20.
3. DeMattos AZ, DeMattos AA, Daros LF, Musskopf MI. Aspartate aminotransferase to platelet ratio for the non-invasive prediction of esophageal varies. Ann Hepatol 2013;12:810-4.
4. Rockey DC, Elliot A, Lyles T. Prediction of esophageal varies and variceal hemorrhage in patients with acute upper GI bleeding. J Med Invest 2016;64:745-51.
5. González-Ojeda A, Cervantes-Guevara G, Chávez-Sánchez M, Dávalos-Cobián C, Ornelas- Cázares S, Macías-Amezcua MD. Platelet count/spleen diameter ratio to predict esophageal varies in Mexican patients with hepatic cirrhosis. World J Gastroenterol 2014;20:2079–84.
6. Chen R, Deng H, Ding X, Xie C, Wang W, Shen Q. Platelet count to spleen diameter ratiofor diagnosis of gastroesophageal varies in Liver cirrhosis. A systemic review and metaanalysis. Gastroentrol Res Pract 2017:1-16.
7. Amin M, E1-Bandray A, Fawzi M, Muhammad D, Maossa S. New non-invasive index for detecting esophageal varies in patients with liver cirrhosis. Open Journal of internal medicine 2016;06:101-11.
8. De De Franchis R. Expanding consensus in portal hypertension of Baveno VI. Int JHepatol 2015;63: 743-52.
9. Ilyles T, Elliot A ,Rocket DC. A risk scoring system to predict in hospital mortality in' patients with cirrhosis presenting with upper gastrointestinal bleeding.J.Clin Gastroenterol2014;48:712-20.
10. Stefenescue H,Grigorscue M,Lupsor M,Maniue M, Crisan D, Procopet D, Feier D et al. A new and simple allogrithim for the non-invasive assessment of esophageal varies in cirrhotic patients using serum fibrosis marker and transient elastography. J Gastrointestinal Liver disease2011;20:57-60.
11. Wang JH, Chauh SK, Lu SN, Hung CH, Chen CH, Kee KM, Chang KC, et al. Transient elastography and simple blood markers in the diagnosis of esophageal varies for compensated patients with hepatitis B virus related cirrhosis. J Gastroentrol Hepatol 2012;27:1213-8.
12. Xu X, Xu C, Dai J, Qian J, Pin X. Ratio of platelet count /spleen diameter predicted the presence of esophageal varies in patients with Schitosomiasis liver cirrhosis. Eur J Gastroenterol Hepatol 2016;28:588-99.
13. Gray H. The liver. [online] [cited 2018 June 21] Available from: http://www.bartleby.com/107/250. html.
14. Runyon BA. Practice Guidelines Committee, American association for the Study of Liver Diseases (AASLD). Management of adult patients with ascites due to cirrhosis. Hepatology 2004;39: 841-56.
15. Garcia-Tsao G. Bacterial infections in cirrhosis: treatment and prophylaxis. J Hepatol2005;42: 585-92.
16. Guarner C, Soriano G. Bacterial translocation and its consequences in patients with cirrhosis. Eur J Gastroenterol Hepatol 2005;17:27-31.
17. Snell RS. Clinical Anatomy for Medical Students. 6th ed. Philadelphia: Lippincott Williams& Wilkins, 1995. p.203-11.
18. Sinnatamby CS. Last's Anatomy Regional and Applied. 10th ed. Philadelphia: Churchill Livingstone; 1999. p.241-52.
19. Basmajian JV. Grant's method of anatomy. 10th ed. London: Williams & Wilkins; 1980.p.156-66.
20. Desmet VJ, Roskams T. Cirrhosis reversal: a duel between dogma and myth. J Hepatol2004;40:860-7.
21. Afdhal NH. The natural history of hepatitis C. Semin Liver Dis 2004;24:3-8.
22. Vong S, Bell BP. Chronic liver disease mortality in the United States, 1990-1998.Hepatology 2004; 39:476-83.
23. Bataller R, North KE, Brenner DA. Genetic polymorphisms and the progression of liver fibrosis: a critical appraisal. Hepatology 2003;37: 493-503.
24. Bataller R, Brenner DA. Liver fibrosis. J Clin Invest 2005;115:209-18.
25. Chen TA, Tsao YC, Chen A, Lo GH, Lin CK, Yu HC, et al. Effect of intravenous albumin on endotoxin removal, cytokines, and nitric oxide production in patients with cirrhosis and spontaneous bacterial peritonitis. Scand J Gastroenterol 2009;44:619-25.
26. Groszmann RJ, Abraldes JG. Portal hypertension: from bedside to bench. J Clin Gastroenterol 2005; 39:S125-30.