Platelet Count–Splenic Diameter Ratio as a Non-Invasive Predictor of Esophageal Varices Using Paquet Classification in Patients with Cirrhosis: A Cross-Sectional Study

Dr. Deepak Raj[1], Dr. Umashankar R[2], Dr. Aishwarya Lakshmi M V[3], Dr. Razook Fareedh[4], Dr. Saketh Ramineni[5]

[1]Junior Resident, Department of General Medicine, Sree Balaji Medical College and Hospital, Bharath Institute of Higher Education and Research, Chennai, India. Ph number: 9342720726.
Email: deepakraj.maa@gmail.com. Orcid id: 0009-0000-6427-3719

[2]Associate Professor, Department of General Medicine, Sree Balaji Medical College and Hospital, Bharath Institute of Higher Education and Research, Chennai, India. Ph number: 8072250460.
Email: smart.uma89@gmail.com. Orcid ID: 0000-0001-5837-2382

[3]Assistant Professor, Department of General Medicine, Sree Balaji Medical College and Hospital, Bharath Institute of Higher Education and Research, Chennai, India. Ph number: 63699 40241.
Email: aishwaryavenkat2193@gmail.com. Orcid ID: 0009-0004-4686-8822

[4]Assistant Professor, Department of General Medicine, Sree Balaji Medical College and Hospital, Bharath Institute of Higher Education and Research, Chennai, India. Ph number: 99434 43752.
Email: drrazookfareedh@gmail.com. Orcid ID: 0009-0009-9622-9574

[5]Assistant Professor, Department of General Medicine, Sree Balaji Medical College and Hospital, Bharath Institute of Higher Education and Research, Chennai, India. Ph number: 6374303270.
Email: rsaketh1992@gmail.com. Orcid ID: 0000-0002-0872-5191

Abstract

Background

Portal hypertension is a common and serious complication of liver cirrhosis that leads to the development of portosystemic collateral circulation, including esophageal varices. Variceal hemorrhage remains one of the most severe and life-threatening consequences of cirrhosis and contributes significantly to morbidity and mortality (1,5). Although upper gastrointestinal endoscopy is the gold standard for the detection and grading of esophageal varices, routine endoscopic screening for all cirrhotic patients may not be feasible in many clinical settings due to cost, invasiveness, and limited availability of endoscopic facilities (5,16).

Splenomegaly and thrombocytopenia are common manifestations of portal hypertension. The platelet count–splenic diameter ratio (PSDR) integrates these two parameters and has been proposed as a simple, inexpensive, and non-invasive predictor of esophageal varices (8).

Objective

To evaluate the platelet count–splenic diameter ratio as a non-invasive predictor of the presence and severity of esophageal varices using Paquet classification in patients with cirrhosis.

Methods

This hospital-based cross-sectional study was conducted in the Department of General Medicine at Sree Balaji Medical College and Hospital, Chennai, between July 2024 and December 2025. Eighty adult patients with clinically and radiologically diagnosed cirrhosis were included in the study. Platelet counts were measured using standard hematological methods, and splenic diameter was assessed through ultrasonography along the longest axis. The platelet count–splenic diameter ratio was calculated for each patient. Upper gastrointestinal endoscopy was performed to detect and grade esophageal varices according to Paquet classification (7).

Results

Among the 80 patients studied, esophageal varices were identified in 72 patients (90%). According to Paquet classification, Grade I varices were observed in 10 patients (12.5%), Grade II in 14 patients (17.5%), Grade III in 18 patients (22.5%), and Grade IV in 30 patients (37.5%). Eight patients (10%) had no esophageal varices. The mean platelet count–splenic diameter ratio was significantly lower in patients with esophageal varices compared to those without varices. A progressive decline in PSDR was observed with increasing grades of varices.

Conclusion

The platelet count–splenic diameter ratio is a simple, inexpensive, and reliable non-invasive marker for predicting both the presence and severity of esophageal varices in patients with cirrhosis. PSDR may help identify patients who require early endoscopic evaluation, particularly in resource-limited settings.

How to cite this article: Raj D, Umashankar R, Lakshmi MV A, Fareedh R, Ramineni S. Platelet Count–Splenic Diameter Ratio as a Non-Invasive Predictor of Esophageal Varices Using Paquet Classification in Patients with Cirrhosis: A Cross-Sectional Study. Int J Drug Deliv Technol. 2026;16(13s): 373-378. DOI: 10.25258/ijddt.16.13s.40

Introduction

Cirrhosis represents the final stage of chronic liver disease and is characterized by diffuse hepatic fibrosis, nodular regeneration, and distortion of normal hepatic architecture (1,4). The progressive structural changes within the liver lead to increased intrahepatic resistance and the development of portal hypertension, which is responsible for many of the complications associated with advanced liver disease (5).

Portal hypertension results in the formation of portosystemic collateral circulation, including esophageal and gastric varices (5,17). Esophageal varices are among the most clinically significant complications of portal hypertension because of their potential to rupture and cause life-threatening gastrointestinal bleeding (11). The mortality associated with the first episode of variceal bleeding has been reported to be between 15% and 20% (11,23).

Current clinical guidelines recommend screening endoscopy for all patients with cirrhosis to detect esophageal varices and determine the need for prophylactic therapy (16,25). However, routine endoscopic screening may not always be feasible due to cost, patient discomfort, and limited availability of endoscopic services in many healthcare settings (18).

Consequently, considerable interest has emerged in identifying reliable non-invasive predictors of esophageal varices (18). Several clinical, laboratory, and imaging parameters have been investigated for this purpose. Among these, thrombocytopenia and splenomegaly have demonstrated strong associations with portal hypertension (9,10).

Splenomegaly occurs due to chronic congestion of the splenic venous system in portal hypertension (10). The enlarged spleen sequesters and destroys platelets, leading to thrombocytopenia (9). Therefore, both platelet count and splenic diameter reflect the hemodynamic consequences of portal hypertension.

The platelet count–splenic diameter ratio was first proposed by Giannini et al. as a non-invasive predictor of esophageal varices in patients with cirrhosis (8). Since then, several studies have evaluated its diagnostic accuracy in predicting the presence of esophageal varices (18,21). However, relatively limited data are available correlating PSDR with standardized grading systems such as Paquet classification.

The present study was therefore undertaken to evaluate the association between platelet count–splenic diameter ratio and both the presence and severity of esophageal varices in patients with cirrhosis.

Methodology

Study Design

This study was designed as a hospital-based cross-sectional observational study.

Study Setting

The study was conducted in the Department of General Medicine and the Department of Medical Gastroenterology at Sree Balaji Medical College and Hospital, Chennai.

Study Duration

The study was carried out over a period of 18 months from July 2024 to December 2025.

Study Population

The study population consisted of adult patients diagnosed with liver cirrhosis who attended the outpatient and inpatient departments during the study period.

Sample Size

A total of 80 patients meeting the inclusion criteria were included in the study.

Inclusion Criteria

- Patients aged 18 years and above
- Patients with clinically, biochemically, and radiologically diagnosed cirrhosis
- Patients undergoing screening upper gastrointestinal endoscopy for esophageal varices

Exclusion Criteria

- Patients presenting with active upper gastrointestinal bleeding
- Patients with previous endoscopic variceal ligation or sclerotherapy
- Patients who had undergone surgical or shunt procedures for portal hypertension
- Patients receiving beta-blocker therapy for variceal prophylaxis
- Patients unwilling to provide informed consent

Data Collection

A detailed clinical history was obtained from each patient, including demographic information, presenting symptoms, and relevant medical history. A thorough physical examination was performed, with particular attention to signs of chronic liver disease and portal hypertension.

Laboratory Investigations

All patients underwent the following laboratory investigations:

- Complete blood count including platelet count
- Liver function tests
- Prothrombin time and INR

Platelet counts were measured using standard automated hematology analyzers.

Radiological Assessment

Abdominal ultrasonography was performed for all patients using a standardized protocol. Splenic diameter was measured along the longest longitudinal axis by an experienced radiologist.

Calculation of Platelet Count–Splenic Diameter Ratio

The platelet count–splenic diameter ratio was calculated using the following formula:

PSDR = Platelet count / Splenic diameter

Endoscopic Evaluation

Upper gastrointestinal endoscopy was performed by an experienced gastroenterologist to detect the presence of esophageal varices. Varices were graded according to Paquet classification:

Grade I – Small straight varices

Grade II – Enlarged tortuous varices occupying less than one-third of the lumen

Grade III – Large coil-shaped varices occupying more than one-third of the lumen

Grade IV – Very large varices occupying almost the entire lumen

Results

Demographic Profile

Table 1 – Age distribution

Age Category	Frequency	Percent
30-39	8	10
40-49	26	32.5
50-59	25	31.2
60-70	21	26.2
Total	80	100

Graph 1 – Age distribution

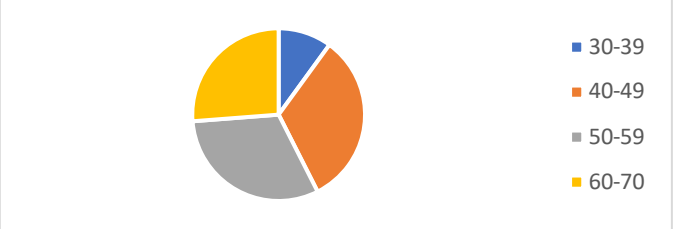
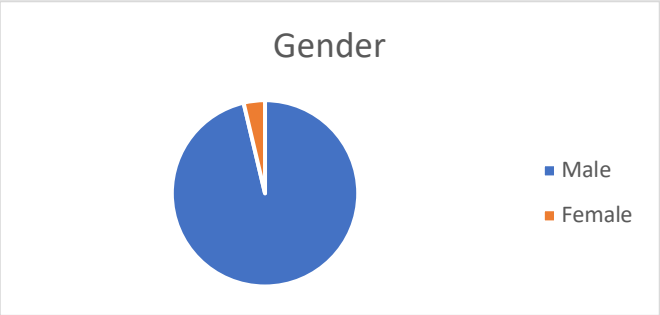


Table 2 – Gender distribution

Gender	Frequency	Percentage
Male	77	96.3%
Female	3	3.7%
Total	**80**	**100%**

Graph 2 – Gender distribution



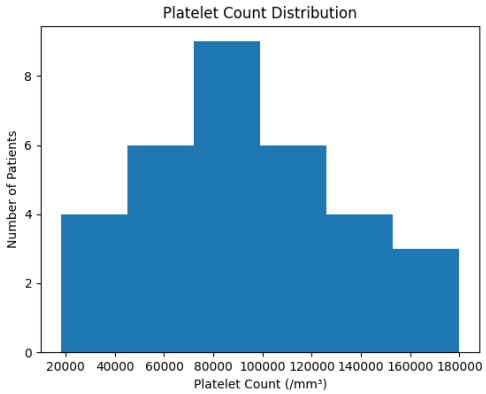
The majority of patients belonged to the fifth decade of life, and males constituted the predominant proportion of the study population.

Platelet Count

Table 3 – Platelet count distribution

Parameter	Value
Mean platelet count (/mm³)	80,600
Median platelet count (/mm³)	78,000
Standard deviation (/mm³)	34,200
Minimum platelet count (/mm³)	18,000
Maximum platelet count (/mm³)	180,000

Graph 3 – Platelet count distribution



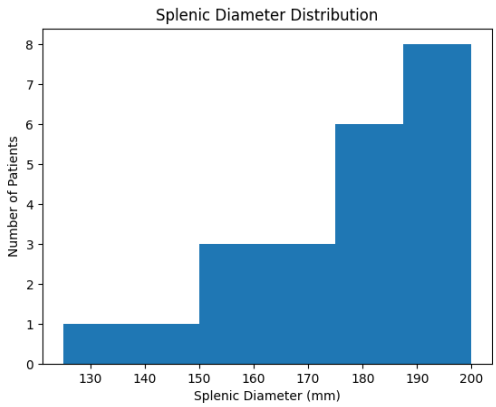
Thrombocytopenia was commonly observed among patients with cirrhosis.

Splenic Diameter

Table 4 – Splenic diameter distribution

Parameter	**Value**
Mean splenic diameter (mm)	183.9
Median splenic diameter (mm)	185
Standard deviation (mm)	18.6
Minimum splenic diameter (mm)	125
Maximum splenic diameter (mm)	200

Graph 4 – Splenic diameter distribution



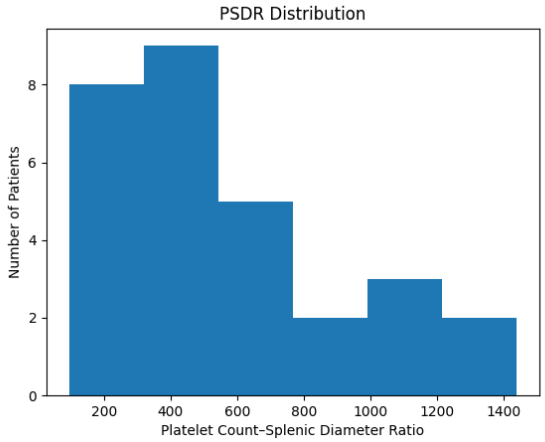
Splenomegaly was frequently observed in patients with portal hypertension.

Platelet Count–Splenic Diameter Ratio

Table 5– PSDR distribution

Parameter	**Value**
Mean PSDR	478.6
Median PSDR	420.5
Standard deviation	312.4
Minimum PSDR	94.7
Maximum PSDR	1440.0

Graph 5– PSDR distribution

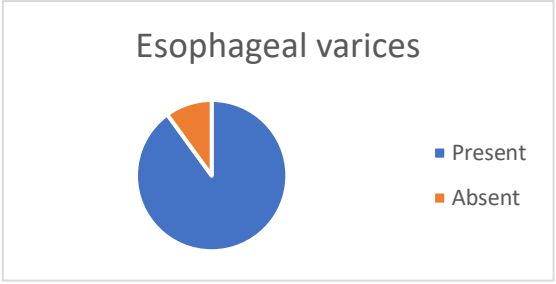


Endoscopic Findings

Table 6– Presence of esophageal varices

Esophageal Varices	Frequency	Percentage
Present	72	90.0%
Absent	8	10.0%
Total	80	100%

Graph 6– Presence of esophageal varices



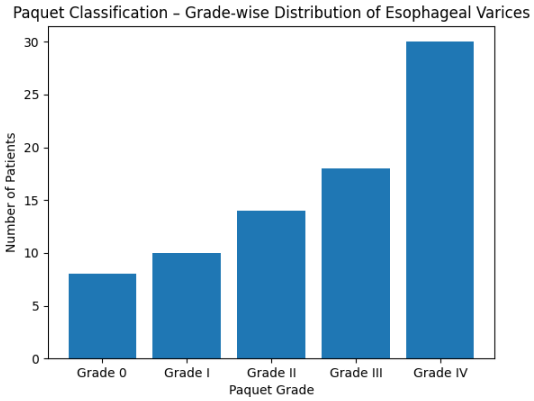
Esophageal varices were detected in 72 patients (90%), while 8 patients (10%) had no varices.

Paquet Classification

Table 7– Grade distribution

Paquet Grade	Frequency	Percentage
Grade 0 (No varices)	8	10.0%
Grade I	10	12.5%
Grade II	14	17.5%
Grade III	18	22.5%
Grade IV	30	37.5%
Total	80	100%

Table 7– Grade distribution



Grade distribution was as follows:

Grade I – 12.5%
Grade II – 17.5%
Grade III – 22.5%
Grade IV – 37.5%

Correlation Between PSDR and Variceal Grade

Table 8– Correlation analysis

Esophageal Varices	Number (n)	Mean PSDR	Standard Deviation
Present	72	393.0	269.2
Absent	8	1248.8	120.9

A strong inverse correlation was observed between PSDR and Paquet grade ($r = -0.71$, $p < 0.001$).

Discussion

The present study evaluated the platelet count–splenic diameter ratio as a non-invasive predictor of esophageal varices in patients with cirrhosis.

A high prevalence of esophageal varices was observed in the study population. This finding is consistent with previous studies conducted in tertiary care centers where cirrhotic patients frequently present at advanced stages of portal hypertension (22,24).

One of the most important findings of this study was the significantly lower PSDR among patients with esophageal varices compared to those without varices. This observation supports the pathophysiological relationship between portal hypertension, splenomegaly, and thrombocytopenia (9,10).

Portal hypertension leads to splenic venous congestion and enlargement of the spleen. The enlarged spleen sequesters platelets, resulting in thrombocytopenia (9). The platelet count–splenic diameter ratio therefore reflects both anatomical and functional consequences of portal hypertension.

Another important observation was the progressive decline in PSDR with increasing grades of esophageal varices. Patients with higher Paquet grades demonstrated lower ratio values, suggesting that PSDR correlates with the severity of portal hypertension.

These findings are consistent with earlier studies that have evaluated PSDR as a non-invasive predictor of esophageal varices (8,21). Giannini et al. first demonstrated that PSDR could reliably predict the presence of esophageal varices in patients with cirrhosis (8).

From a clinical perspective, the use of PSDR may help identify patients who require priority endoscopic evaluation. This approach may be particularly valuable in resource-limited settings where routine endoscopic screening for all cirrhotic patients may not be feasible (18,25).

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