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Original Research

To Study Platelet Count/Spleen Diameter (PC/SD) Ratio as A Non-Invasive Marker for Predicting Esophageal Varices in Decompensated Chronic Liver Disease Patients

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Abstract
Objectives –Esophageal varices is a life-threatening complication of decompensated lever disease but requires invasive testing for detection. This study aims to evaluate platelet count/spleen diameter as a non-invasive marker for detecting Esophageal varices in Decompensated chronic liver disease patients.
Materials and Method: This study was conducted at S.V.B.P. Hospital in Meerut, Uttar Pradesh. 100 admitted stable Decompensated chronic liver disease patients were taken for the study.
Results-Among 100 CLD patients (71% male, 29% female), 52% were alcoholic, 47% were HCV positive, and 24% had no alcohol or viral history. Patients with a PC/SD ratio ≤ 909 showed 100% sensitivity and100% NPV for ruling out esophageal varices but moderate specificity (40.8%) and PPV (63.8%) for ruling in esophageal varices.
Conclusion- The PC/SD ratio is a reliable, non-invasive tool for ruling out esophageal varices in CLD patients, but further research is needed to validate its use across diverse populations.
Keywords- Esophageal Varices, Decompensated chronic liver disease, Platelet Count/Spleen Diameter (PC/SD)

INTRODUCTION

Esophageal varices, resulting from portal hypertension, are a significant complication of cirrhosis, with a prevalence as high as 70% in patients with decompensated cirrhosis, of whom approximately one-third may experience variceal bleeding(1,2).

According to the Baveno VII consensus on portal hypertension, upper gastrointestinal (UGI) endoscopy is recommended for all cirrhotic patients at the time of chronic liver disease (CLD) diagnosis to assess for esophageal varices. In patients with small varices, follow-up UGI endoscopy is suggested every 1–2 years, while those without varices should undergo endoscopy every 2–3 years.(3)

While endoscopy is effective, it is an invasive and often uncomfortable procedure with limited availability and high costs, which can reduce feasibility, especially in patients with comorbidities or financial constraints. This highlights the need for non-invasive, accessible, and cost-effective methods to accurately diagnose esophageal varices.(4)

In this context, the present study aims to examine the relationship between platelet count, spleen diameter, and their ratio in relation to the presence of esophageal varices in cirrhotic patients without prior gastrointestinal bleeding.

AIMS AND OBJECTIVE

To use Platelet Count/Spleen Diameter (PC/SD) as a non-invasive marker for Esophageal Varices in Decompensated Chronic Liver Disease patients.

MATERIAL AND METHODS

This study was conducted at S.V.B.P. Hospital in Meerut, Uttar Pradesh, over the period from 2022 to 2023 as a cross-sectional, single-center investigation. All participants were admitted to the hospital ward and evaluated. Informed consent was obtained from each patient. A comprehensive history was recorded, with particular attention to factors associated with chronic liver disease (CLD). Detailed general physical and systemic examinations were also performed to identify clinical signs indicative of liver cell failure, including jaundice, palmar erythema, spider nevi, alopecia, and testicular atrophy among others.

Inclusion Criteria

- Age ≥ 18 years

- Diagnosis of Chronic Liver Disease confirmed by clinical, biochemical, and ultrasonographic evidence

Exclusion Criteria

- Age < 18 years
- Patients with human immunodeficiency virus (HIV)
- Patients with hepatocellular carcinoma (HCC) or portal vein thrombosis
- Patients with severe or unstable cardiovascular, renal, pulmonary or haematological disorders
- Patients with upper GI bleed due to causes other than esophageal varices
- Patients who previously underwent injection sclerotherapy, band ligation, or surgery for esophageal varices (e.g., TIPS)
- Patients contraindicated for endoscopy
- Patients with any co-existing condition influencing liver and/or spleen size

Laboratory Investigations

• Complete hemogram, including platelet count
• Coagulation profile: Bleeding time (BT), clotting time (CT), prothrombin time (PT), activated partial thromboplastin time (aPTT) with INR
• Liver function tests (LFT): total bilirubin with direct and indirect bilirubin, SGOT, SGPT, Total serum protein with albumin, globulin and A:G ratio, alkaline phosphatase (ALP) • Renal function tests (RFT): serum urea, serum creatinine, electrolytes
• Serological tests: Anti-HCV antibodies, HBsAg, HIV

Imaging and Endoscopy

• Ultrasound (USG) abdomen was performed to measure spleen bipolar diameter using ESAOTE S.p.A (3PCON), Genova ITALY.
• Upper GI endoscopy was performed using a video endoscope.
Esophageal varices were graded as follows:
o Grade 1: Straight and unbendable
o Grade 2: Tortuous, occupying < 1/3 of the esophageal lumen
o Grade 3: Large, occupying > 1/3 of the esophageal lumen

CHILD PUGH TURCOTT Classification

• Patients were classified using the CHILD PUGH TURCOTT criteria, based on five parameters: Bilirubin, Albumin, INR, Ascites, and Hepatic Encephalopathy.
• Scores for each parameter were summed to classify patients into
Class A, B, or C.

Parameter	1 Point	2 Points	3 Points
Bilirubin (mg/dL)	< 2.0	2.0 - 3.0	> 3.0
Albumin (g/dL)	> 3.5	2.8 - 3.5	< 2.8
INR	< 1.7	1.7 - 2.3	> 2.3
Ascites	None	Mild to Moderate (diuretic responsive)	Moderate to Severe (diuretic refractory)
Hepatic Encephalopathy	None	Grade 1-2 (or precipitant-induced)	Grade 3-4 (chronic)

Total Score	Class
5-6	A
7-9	B
10-15	C

RESULTS

A total of 100 patients with chronic liver disease (CLD) were included in the study.
71% were male and 29% were female. (Table 1).
43% were in the 40-49 age group, 24% aged 60+, 22% were in the 50-59 age group, and 10% in 30-39 age group (Table 2). Males predominantly fell within the 40-49 age range (38/71), whereas females were evenly distributed, with a significant proportion in the 60+ age group (15 out of 29).
The mean age for males was 47.66 ± 2.04 years, while for females, it was 59.72 ± 5.36 years.

52% of all patients were alcoholic, all of which were males.47% were HCV positive. Only 3% were Hepatitis B virus (HBV) reactive. Notably, 24 patients (24%) had no history of alcohol use and tested negative for both HBV and HCV. A substantial subset of males (23 out of 71) was both alcohol users and HCV positive, highlighting a compounded risk factor for CLD within this group. (Table 3)

Among patients with a platelet count-to-spleen diameter (PC/SD) ratio of ≤ 909, 51 were found to have esophageal varices on upper GI endoscopy, indicating a strong association between lower PC/SD ratios and the presence of varices. The PC/SD ratio demonstrated a sensitivity and Negative Predictive Value (NPV) of 100% for ruling out esophageal varices, establishing it as a highly reliable metric for exclusion. The Positive Predictive Value (PPV) was 63.8%, with a specificity of 40.8%, suggesting that while the PC/SD ratio is highly effective in ruling out varices, its ability to confirm the presence of varices remains moderate. (Table 4)

Table 1 : Sex wise distribution of cases

SEX	NO. OF PATIENTS
MALE	**71**
FEMALE	**29**

Table 2 : Age wise distribution of Chronic liver disease patients

AGE GROUP (YRS.)	MALE	FEMALE	TOTAL	
	No.	**No.**	**No.**	**%**
30-39	**9**	**1**	**10**	**10.00**
40-49	**38**	**5**	**43**	**43.00**
50-59	**15**	**7**	**22**	**22.00**
60+	**9**	**15**	**24**	**24.00**
TOTAL	**71**	**29**	**100**	**100.00**

Table 3: Causes of Chronic Liver Disease patients

GENDER-ALCOHOLIC	**HBSAG REACTIVE**	**HCV REACTIVE**	**NON-REACTIVE**	**TOTAL**
F, NO	0	12	17	29
M, NO	0	12	7	19
M, YES	3	23	26	52
TOTAL	3	47	50	100

Table 4 distribution of cases according to platelet count/spleen

PC/SD Category	**Esophageal Varices**	
	Absent	**Present**
<=909	0	51
>909	20	29

- Sensitivity = 1.000

- Specificity = 0.408
- PPV (Positive Predictive Value) = 0.638
- NPV (Negative Predictive Value) = 1.000

DISCUSSION

A significant male predominance is observed, with 71% of patients being male and 29% female. This aligns with the study by Guy et al. (2013), which highlighted the influence of gender on liver disease epidemiology, natural history, and patient outcomes. Notably, men are twice as likely to die from chronic liver disease and cirrhosis as women (5).

Male patients predominantly fall within the 40-49 age group whereas female patients mostly fall in the 60+ age group. Males developed CLD approximately 13 years earlier than females, consistent with previous studies. Cooper et al. (2023) similarly found that men develop CLD at a younger age than women, attributing this to factors like higher alcohol consumption rates and the protective effects of estrogen against liver fibrosis and injury, which may delay CLD onset in women (6).

Alcohol consumption and hepatitis infections (HBV and HCV) were the leading causes of CLD. 52% of patients had a history of alcoholism, all of whom were males. No female patients reported a history of alcoholism. Hepatitis C infection was prevalent in 47% of patients (35% males, 12% females). Hepatitis B infection was found in 3% of male patients. 24% of patients neither consumed alcohol nor tested positive for HBV or HCV, indicating alternative causes. A meta-analysis by Swaroop et al. (2024) identified alcohol as the most common cause of CLD in India, followed by NAFLD/cryptogenic and hepatitis B. (7) However, our study's findings differ, with alcoholism remaining the most common cause, followed by hepatitis C (47%), and then other causes. This discrepancy may be attributed to the high demographic prevalence of hepatitis C in Western Uttar Pradesh. Further studies are needed to corroborate these findings. The PC/SD ratio may serve as a non-invasive, cost-effective screening tool for identifying high-risk patients for developing esophageal varices.

Comparison with existing literature: Our findings align with previous studies that evaluated the sensitivity and specificity of the PC/SD ratio in predicting esophageal varices:

- **Gianni et al. (2003)**: sensitivity (100%), specificity (93%) (8)
- **Baig et al. (2008)**: sensitivity (80%), specificity (89%) (9)
- **Sarangapani et al. (2010)**: sensitivity (88.5%), specificity (83%)(10)
- **Schwarzenberger et al. (2010)**: sensitivity (80%), specificity (40%) (11)
- Our study: sensitivity (100%), specificity (40.8%)
- **Patil et al. (2024):** sensitivity (90.9%), specificity (80.8%) with a positive predictive value of 82.56% (12)

PC/SD ratio has sensitivity but low specificity suggesting that it can used to rule out the presence of esophageal varices but not very specific.

CONCLUSIONS

Males are more commonly affected by chronic liver disease (CLD) and tend to develop the condition at a younger age compared to females. Alcoholism remains the leading cause of CLD, followed by Hepatitis C infection. The high prevalence of Hepatitis C observed in our study population, relative to other studies, indicates a growing disease burden in Western Uttar Pradesh, underscoring the need for further research to validate these findings.

The Platelet Count/Spleen Diameter (PC/SD) ratio emerges as a robust non-invasive parameter independently associated with the presence of esophageal varices, regardless of the underlying aetiology in CLD patients. A PC/SD ratio cut-off of 909 demonstrates high sensitivity and a Negative Predictive Value (NPV) of 100%, making it a reliable tool for ruling out esophageal varices. However, additional research is essential to replicate and generalize these findings across broader populations.

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