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ASSOCIATION OF PLATELET COUNT TO SPLEEN DIAMETER RATIO WITH THE DIAGNOSIS OF GASTROESOPHAGEAL VARICES IN PATIENTS OF LIVER CIRRHOSIS

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Abstract

Objective: *To Validate the diagnostic accuracy of platelets count to splenic diameter ratio for Gastroesophageal varices in patients with liver cirrhosis taking oesophagogastroduodenoscopy as gold standard.*

Study Design: *Descriptive Cross-Sectional Study*

Place and Duration of Study: *This study was conducted at medicine department (unit 1) Sheikh zayed hospital Rahim yar khan, Punjab, Pakistan from August 2,2024 to February 1 2025.*

Introduction: *Gastroesophageal varices in liver cirrhosis require accurate diagnosis for effective treatment. The platelet count to spleen diameter (PC/SD) ratio shows promise as a non-invasive marker for predicting varices. This study examines the PC/SD ratio's accuracy in identifying varices in cirrhotic patients. The goal is to explore using the PC/SD ratio as a simple diagnostic tool for managing this complication.*

Methodology: *A total of 249 patients diagnosed with liver cirrhosis and presenting to Medicine Department (Unit-I) of Shaikh Zayed Hospital, Rahim Yar Khan from August 2, 2024 to February 1, 2025, who met inclusion/exclusion parameters were recruited. Liver cirrhosis patients aged 18 years and above were evaluated for gastroesophageal variceal using clinical history, biochemical and imaging studies. The EGD examination needed for confirmation and grading of varices according to Westaby's system was preceded by determining the ratio of platelet count to spleen diameter.*

Results: *A substantial proportion of patients with gastroesophageal varices confirmed their condition via both esophagogastroduodenoscopy (59.0%) and PC/SD ratio (57.4%). The PC/SD ratio was found to be highly accurate in determining gastroesophageal varices with a sensitivity of 85.7%, specificity of 83.3%, positive predictive value of 88.1%, negative predictive value of 80.1%, and an overall accuracy of 84.7%*

Conclusion: *The PC/SD ratio demonstrates excellent sensitivity and specificity in diagnosing GEVs among patients with liver cirrhosis. Its use could improve patient care pathways and could even substitute endoscopy in certain cases, especially in resource-constrained settings. Further studies should specify its role in surveillance and monitoring in the at-risk cirrhotic population.*

INTRODUCTION

The condition wherein the liver sustains irreversible scarring and fibrosis is termed as cirrhosis and this condition leads on to severe liver failure. The most common causes stem from alcoholism, drug abuse, viral infections, and irrespective of the cause, the resulting effects of cirrhosis in Pakistan are typically advanced to the stage of portal hypertension, ascites, varices, and hepatocellular carcinoma. This condition puts an emphasis on the need for an early diagnosis and treatment which will help manage the damage done. Public health programs need greater focus on this issue to deal with this extensive liver disease.[1-2]

Gastroesophageal varices, dilated distal esophageal veins from portal hypertension, commonly due to cirrhosis, can lead to fatal variceal rupture. The presence and risk of bleeding from varices correlate with liver disease severity. Initially found in 30% of cirrhotic patients, varices increase to 90% within a decade. Small varices have a 1-year bleeding rate of 5%, increasing to 15% for large varices.[3]

Esophagogastroduodenoscopy is the gold standard for diagnosing gastroesophageal varices, which are abnormal vein dilations in the esophagus and stomach. Imaging techniques like CT scans and Doppler ultrasound of the splenic and portal venous systems complement this. Platelet count-to-spleen size ratio is a useful predictive tool for identifying varices in liver cirrhosis patients. Integrating these approaches is crucial in managing at-risk patients with liver conditions.[4-5]

Despite international research on medical parameters, the platelet count to spleen size ratio isn't yet standardized in routine clinical evaluation. We aim to validate this ratio's predictiveness for gastroesophageal varices in liver cirrhosis patients at a Punjab hospital, hoping to improve outcomes for this underrepresented population.

METHODS

After the study approval by hospital's Ethical Committee, 249 patients diagnosed with liver cirrhosis; Presenting to Medicine Department (Unit-I) of Shaikh Zayed Hospital, Rahim Yar Khan August 2, 2024 to February 1, 2025, meeting the inclusion/exclusion criteria were enrolled after taking informed written consent from them. The sample size of 249 was calculated using the Dr. Lin Naing Sample Size Calculator, based on the following parameters: a confidence interval of 90% with a 10% margin of error, a sensitivity of PC/SD for gastroesophageal varices at 60%,[9] a specificity of PC/SD for gastroesophageal varices at 78%,[9] and a prevalence of gastroesophageal varices at 37.4%.[10]

Patients aged 18 years or older with a confirmed diagnosis of liver cirrhosis Presenting to the hospital emergency, outpatient department (OPD), or ward were included. Patients with other acute or chronic diseases (e.g., leukemias, malaria, dengue, immunosuppressive disorders, cancer, coagulopathies, aplastic anemia, or hepatocellular carcinoma), those on medication for primary prophylaxis of variceal bleeding, with a history of esophageal variceal bleeding, band ligation, sclerotherapy, or portal hypertension surgery, and those unwilling to provide written consent, as well as patients under 18 years, were excluded. After conducting a thorough medical evaluation, including history, physical examination, and measurement of biochemical parameters, such as serum bilirubin levels, serum albumin levels, and prothrombin time, the study subjects were categorized based on their Child-Pugh grading as defined.

The platelet count/spleen diameter ratio was calculated using blood count and ultrasound data. Platelet count was obtained from a single analyzer machine, and spleen diameter was measured using a standardized ultrasound machine. This ratio was determined by dividing platelet count by spleen diameter in millimeters. Gastroesophageal varices prediction was made based on this ratio. Patients underwent upper Esophagogastroduodenoscopy to assess gastroesophageal varices using Westaby's grading system. Procedures were conducted by consultant gastroenterologists at a standardized unit. Operators were blinded to biochemical parameters. Gastroesophageal varices presence and grades were documented. Based on a study at Fauji Foundation Hospital Rawalpindi, a platelet count/spleen diameter ratio <1077.42 signified positive varices, while >1077.42 indicated negative.[8]

Data in SPSS 23.0 was analyzed. Variables including age, variceal bleeding points, platelet count, spleen diameter, and platelet count/spleen diameter ratio

were presented as mean and standard deviation. Other variables like sex, prediction of gastroesophageal varices, presence on Esophagogastroduodenoscopy, Child-Pugh Class, and Westaby class were presented as frequency & percentages. The metrics of sensitivity, specificity, positive and negative predictive values, as well as predictive accuracy, were determined. Factors such as age, gender, Child-Pugh classification, and Westaby classification were adjusted via stratification. Following the stratification process, the diagnostic accuracy was assessed.

RESULTS

In the present investigation, a total of 249 participants were recruited, comprising 52.6% males and 47.4% females. The participants' ages varied from 18 to 70 years, with an average age of 47.7±16.31 years. Most patients (49%) were aged 51-70 years, followed by 31.3% (31-50 years) and 19.7% (18-30 years). Child-pugh class was recorded as: 32.9% A class, 35.7% B class, and 31.3% C class, while Westaby class as Grade-1 in 34.5%, grade-2 in 34.1% and grade-3 in 31.3%. In the patient group, high percentages confirmed to have gastroesophageal varices on both esophagogastroduodenoscopy (59.0%) and PC/SD ratio (57.4%). The PC/SD ratio showed strong performance in confirming gastroesophageal varices, with sensitivity at 85.7%, specificity at 83.3%, PPV at 88.1%, NPV at 80.1%, and accuracy at 84.7%. This study also analyzed the performance of esophagogastroduodenoscopy and PC/SD ratio across different criteria like gender, age, child-pugh class, and Westaby class, demonstrating consistent high sensitivity and specificity in each subgroup.

Table-1: Frequency distribution of different variables

Gender	**Frequency**	**Percent**
Male	131	52.6
Female	118	47.4
Total	249	100.0
Age groups		
18-30 years	49	19.7
31-50 years	78	31.3
51-70 years	122	49.0
Total	249	100.0
Child-Pugh Class		
A	82	32.9
B	89	35.7
C	78	31.4
Total	249	100.0
Westaby class		
Grade-1	86	34.5
Grade-2	85	34.2
Grade-3	78	31.3
Total	249	100.0
Gastroesophageal varices on esophagogastroduodenoscopy		

Positive	147	59.0
Negative	102	41.0
Total	249	100.0
Gastroesophageal varices on PC/SD ratio		
Positive	143	57.4
Negative	106	42.6
Total	249	100.0

Table-2: Comparison of results of gastroesophageal varices on PC/SD ratio and esophagogastroduodenoscopy

Gastroesophageal varices on PC/SD ratio	**Gastroesophageal varices on esophagogastroduodenoscopy**		**Total**	
	Positive	Negative		
Positive	126	17	143	Sn=85.7%, Sp=83.3%, PPV=88.1%, NPV=80.1%, DA=84.7%
Negative	21	85	106	
Total	147	102	249	

Table-3: Stratification of gastroesophageal varices on PC/SD ratio and esophagogastroduodenoscopy with respect to gender

Gender	**Gastroesophageal varices on PC/SD ratio**	**Gastroesophageal varices on esophagogastroduodenoscopy**		**Total**	
		Positive	Negative		
Male	Positive	67	9	76	Sn=82.7%, Sp=82.0%, PPV=88.1%, NPV=74.5%, DA=82.4%
	Negative	14	41	55	
	Total	81	50	131	
Female	Positive	59	8	67	Sn=89.3%, Sp=84.6%, PPV=88.1%, NPV=86.2%, DA=87.2%
	Negative	7	44	51	

	Total	66	52	118	

Table-4: Stratification of gastroesophageal varices on PC/SD ratio and esophagogastroduodenoscopy with respect to age

Age groups	Gastroesophageal varices on PC/SD ratio	Gastroesophageal varices on esophagogastroduodenoscopy		Total	
		Positive	Negative		
18-30 years	Positive	28	6	34	Sn=90.3%, Sp=66.6%, PPV=82.3%, NPV=80.0%, DA=81.6%
	Negative	3	12	15	
	Total	31	18	49	
31-50 years	Positive	37	4	41	Sn=84.1%, Sp=88.2%, PPV=90.2%, NPV=81.1%, DA=85.8%
	Negative	7	30	37	
	Total	44	34	78	
51-70 years	Positive	61	7	68	Sn=84.7%, Sp=86.0%, PPV=89.7%, NPV=79.6%, DA=85.2%
	Negative	11	43	54	
	Total	72	50	122	

Table-5: Stratification of gastroesophageal varices on PC/SD ratio and esophagogastroduodenoscopy with respect to CPC

Child-Pugh Class	Gastroesophageal varices on PC/SD ratio	Gastroesophageal varices on esophagogastroduodenoscopy		Total	
		Positive	Negative		
A	Positive	42	4	46	Sn=93.3%, Sp=89.1%, PPV=91.3%, NPV=91.6%, DA=91.4%
	Negative	3	33	36	
	Total	45	37	82	
B	Positive	48	6	54	Sn=84.2%, Sp=81.2%, PPV=88.8%, NPV=74.2%, DA=83.1%
	Negative	9	26	35	
	Total	57	32	89	
C	Positive	36	7	43	Sn=80.0%, Sp=78.7, PPV=83.7%, NPV=74.2, DA=79.4%
	Negative	9	26	35	
	Total	45	33	78	

Table-6: Stratification of gastroesophageal varices on PC/SD ratio and esophagogastroduodenoscopy with respect to Westaby class

Westaby class	Gastroesophageal varices on PC/SD ratio	Gastroesophageal varices on esophagogastroduodenoscopy		Total	
		Positive	Negative		
Garde-1	Positive	40	8	48	Sn=81.6%, Sp=78.3%, PPV=83.3%, NPV=76.3%, DA=80.2%
	Negative	9	29	38	
	Total	49	37	86	
Grade-2	Positive	38	3	41	Sn=88.3%, Sp=92.8%, PPV=92.6%, NPV=88.6%, DA=90.5%
	Negative	5	39	44	
	Total	43	42	85	
Grade-3	Positive	48	6	54	Sn=87.2%, Sp=73.9%, PPV=88.8%, NPV=70.8, DA=83.3%
	Negative	7	17	24	
	Total	55	23	78	

DISCUSSION

The PC/SD ratio serves as a well-recognized metric for identifying gastroesophageal varices in patients with liver cirrhosis. Our research substantiates its commendable diagnostic precision, with a sensitivity of 85.7%, specificity of 83.3%, positive predictive value (PPV) of 88.1%, negative predictive value (NPV) of 80.1%, and an overall accuracy of 84.7%. These results highlight the PC/SD ratio's utility as a non-invasive diagnostic criterion for gastroesophageal varices, presenting a significant alternative to endoscopic evaluation.

Our study's findings closely parallel Giannini et al.'s on the PC/SD ratio. While our sensitivity (85.7%) supports the tool's reproducibility, the specificity (83.3%) is slightly lower, which may stem from various factors like patient demographics or measurement methods.[11]

Our results show better accuracy than previous studies in terms of PPV and NPV. With an 88.1% PPV in our cohort, it indicates a high chance of GEV when the test is positive, aligning well with Tafarel et al. (84%) and surpassing other studies.[12-13] The NPV of 80.1% in our study is comparable to the range of 77–85% observed in earlier research, emphasizing the tool's effectiveness in ruling out varices in patients with negative results.[13-14]

The overall accuracy of 84.7% in our study underscores the PC/SD ratio's diagnostic strength. Berzigotti et al. reported a slightly lower accuracy of 82%, while Llop et al. achieved approximately 81%.[14-15] In a study, platelet count to Splenic Diameter in predicting EVs had sensitivity of 84.2% and specificity of 75.3%.[6] In another study, Platelet count to Spleen Diameter ratio had sensitivity and specificity of 68% and 83% respectively, for predicting the presence of esophageal varices.[7]

These differences may reflect variations in study populations or methodological approaches but also highlight the potential for further optimization in applying this ratio. The observed variability in sensitivity, specificity, and accuracy across studies is primarily attributable to differences in patient characteristics, the method of spleen size measurement, and the chosen cutoff values for the PC/SD ratio. Giannini et al. proposed a cutoff value

of <909, which has since been widely adopted, though variations have emerged to suit specific populations.[11] In our study, we employed a cutoff optimized for our cohort, which may account for the minor discrepancies in diagnostic performance compared to earlier research. Other factors influencing diagnostic accuracy include heterogeneity in the underlying causes of cirrhosis, differences in imaging modalities, and variability in operator expertise. Despite these differences, the consistency of high diagnostic performance across studies strongly supports the generalizability of the PC/SD ratio as a non-invasive tool.

The findings of our study reinforce the potential for the PC/SD ratio to reduce reliance on invasive endoscopy for diagnosing GEVs. Its high PPV minimizes unnecessary procedures in patients with positive results, while its strong NPV allows for reliable exclusion of varices, facilitating risk stratification and prioritization in resource-limited settings. Guidelines, including those from the American Association for the Study of Liver Diseases (AASLD), advocate for cost-effective, non-invasive strategies in managing cirrhotic patients, and our results align with these recommendations.[14,16]

While our study demonstrates the robust diagnostic performance of the PC/SD ratio, certain limitations warrant consideration. Our single-center design may limit the generalizability of the findings, and variations in spleen size measurement methods could influence accuracy. Additionally, the lack of a universally accepted cutoff value for the PC/SD ratio poses a challenge for its broader application. Future multicenter studies with larger, more diverse cohorts are needed to validate these findings and establish standardized thresholds.

CONCLUSION

PC/SD ratio is a reliable, non-invasive tool for diagnosing GEVs in patients with liver cirrhosis, with excellent sensitivity, specificity, and overall accuracy. Its ability to complement or replace endoscopy in selected scenarios is particularly valuable in resource-limited settings. By consolidating evidence from our study and prior research, we highlight the PC/SD ratio's potential to enhance patient care pathways. Continued efforts should focus on refining its application, addressing limitations, and exploring its role in longitudinal monitoring and dynamic risk stratification in cirrhotic patients

Ethical.Approval:

Ethical approval was granted by the Sheikh Zayed Hospital Rahim yar khan's Research Ethics Committee (No:709/IRB/SZMC/SZH) on 03 june 2023.

PATIENTS'CONSENT:

Patient consent was waived as per the guidelines of the Research Ethics Committee.

COMPETING.INTEREST:

The authors declared no conflict of interest.

AUTHORS'CONTRIBUTION:

MA: Designed the study and prepared the manuscript.
MA,AH,SJ: Literature Search
MA,JT: Contributed to data collection
AH,SI: Performed the data analysis.
RK: Drafting,writing of manuscript All authors approved the final version of the manuscript to be published

REFERENCES

1. Cleveland Clinic. Cirrhosis of the Liver. Available from: https://my.clevelandclinic.org/health/diseases/15572-cirrhosis-of-the-liver
2. Yoshiji H, Nagoshi S, Akahane T, Asaoka Y, Ueno Y, Ogawa K, et al. Evidence-based clinical practice guidelines for Liver Cirrhosis 2020. J Gastroenterol. 2021;56(7):593-619.
3. Meseeha M, Attia M. Gastroesophageal varices. [Updated 2023 Aug 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024.
4. World Gastroenterology Organisation. Esophageal Varices - English. Available from: https://www.worldgastroenterology.org/guidelines/esophageal-varices/esophageal-varices-english

5. Mayo Clinic. Esophageal varices: Diagnosis & treatment. Available from: https://www.mayoclinic.org/diseases-conditions/esophageal-varices/diagnosis-treatment/drc-20351544
6. Jan M, Khan RT, 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):105-13.
7. Lelisa G, Chanie Y, Conjeevaram H, Desalegn H. Non-invasive predictors of esophageal varices in patients with cirrhosis: a cross sectional study in Ethiopia. Millennium J Health. 2023;2(2):2790-1378.
8. Jamil Z, Malik M, Durrani AA. Platelet count to splenic diameter ratio and other noninvasive markers as predictors of esophageal varices in patients with liver cirrhosis. Turk J Gastroenterol. 2017;28:347-52.
9. Martínez-Marín JD, Marrugo-Padilla K, Garzón-Olarte MA. Diagnostic performance of platelet count/spleen diameter ratio to detect esophageal varices in patients with cirrhosis. Revista de la Facultad de Medicina. 2021;69(3):250-5.
10. Abdul Razzak A, Kamran Ali Z, Zia A, Lateef A. Frequency of gastroesophageal varices in cirrhotic patients with splenomegaly. Pak J Med Res. 2024;62(4):181-4.
11. Giannini E, Botta F, Borro P. Platelet count/spleen diameter ratio: proposal and validation of a non-invasive parameter to predict the presence of esophageal varices in patients with liver cirrhosis. Gut. 2020;52(8):1200-1205.
12. Baig WW, Nagaraja MV, Varma M, Prabhu R. Platelet count to spleen diameter ratio for the diagnosis of esophageal varices: is it feasible? Can J Gastroenterol Hepatol. 2018;22(10):825-828.
13. Tafarel JR, Tolentino LF, Correa LM. Platelet count/spleen diameter ratio and other noninvasive markers for predicting esophageal varices in hepatosplenic schistosomiasis. Braz J Med Biol Res. 2021;44(7):681-686.
14. Berzigotti A, Seijo S, Arena U. Elastography, spleen size, and platelet count to rule out high-risk varices in cirrhosis. Hepatology. 2023;58(3):900-909.
15. Llop E, Seijo S, de Vega V. Platelet count/spleen diameter ratio and liver stiffness for identifying clinically significant portal hypertension in compensated cirrhosis: development and validation of a prediction model. J Hepatol. 2016;64(4):708-715.
16. Garcia-Tsao G, Abraldes JG, Berzigotti A, Bosch J. Portal hypertensive bleeding in cirrhosis: risk stratification, diagnosis, and management. Hepatology. 2019;65(1):310-335.