International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 9, September 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

Doi-10.69605/ijlbpr_13.9.2024.100

Original Research

Accuracy Of Non-Endoscopic Predictors Of Esophageal Varices In Liver cirrhosis

[1]Dr. Nishita Khanooja, [2]Dr. C.C. Chaubal, [3]Dr. Tarun Nigam

[1]Resident, Department of Medicine, PCMS &RC
[2]Professor, Department of Medicine, PCMS &RC
[3]Assistant Professor, Department of Medicine, PCMS &RC

Corresponding author:
Dr. Nishita Khanooja
Resident, Department of Medicine, PCMS &RC

Received Date:18 August 2024 Accepted Date: 18 September 2024

Abstract:
Background: Esophageal varices (EV) are a common complication of liver cirrhosis, and early detection is crucial for preventing life-threatening bleeding. **Objectives:** To evaluate the accuracy of non-endoscopic predictors of EV in liver cirrhosis and identify potential predictors for risk stratification. **Materials and Method:** This observational analytical cross-sectional study included 65 patients with liver cirrhosis. Non-endoscopic parameters such as platelet count, spleen size, portal vein diameter, and Child-Pugh score were assessed and correlated with EV severity. **Results:** A statistically significant decline in mean platelet count was observed with increasing EV severity (F value = 4.578, p = 0.003). The mean platelet count to spleen diameter ratio also showed a statistically significant difference among groups (F value = 4.173, p = 0.005). However, no significant differences were found in mean spleen size, portal vein diameter, and Child-Pugh scores among different EV grades. **Conclusion:** Platelet count and platelet count to spleen diameter ratio may be useful non-endoscopic predictors of EV in liver cirrhosis. These findings can aid in risk stratification and guide clinical decision-making.
Keywords: Esophageal varices, liver cirrhosis, non-endoscopic predictors, platelet count, spleen size, portal vein diameter, Child-Pugh score.

Introduction

Esophageal varices are enlarged and swollen blood vessels that develop within the walls of the lower part of the esophagus. They are a common complication of liver cirrhosis, a condition characterized by extensive scarring and damage to the liver tissue.[1] Esophageal varices typically occur when the liver becomes unable to effectively process blood flow due to cirrhosis, leading to increased pressure in the veins that supply blood to the liver.[2]Portal hypertension in liver cirrhosis leads to the formation of esophageal varices, a serious complication that can cause life-threatening bleeding if ruptured.[1,2] Risk factors for variceal bleeding include large varices, red signs, and severe liver dysfunction.[2,3] Diagnosis typically involves upper gastrointestinal endoscopy, which allows for direct visualization and assessment of variceal size, appearance, and red signs indicative of recent bleeding.[3] Early detection and risk stratification of EV are crucial for implementing preventive measures and timely interventions to reduce the risk of variceal bleeding. Traditionally, the gold standard for diagnosing EV involves upper gastrointestinal endoscopy (UGIE). However, UGIE is an invasive procedure associated with discomfort, risks of complications, and resource constraints. Therefore, there is a growing interest in non endoscopic predictors of EV in liver cirrhosis to facilitate risk stratification and optimize patient management.[4,5] Non-endoscopic predictors encompass various clinical, laboratory, and imaging parameters that can be readily assessed in clinical practice. These predictors include parameters such as liver function tests, platelet count, and spleen size, as well as imaging modalities like transient elastography (TE) and abdominal ultrasonography (US). Evaluating the accuracy of these non-endoscopic predictors in detecting and predicting the presence and severity of EV is essential for guiding clinical decision-making and optimizing resource utilization in the management of patients with liver cirrhosis.[5] Hence, this study seeks to elucidate the diagnostic performance of various non-invasive tools and identify potential predictors that can reliably stratify the risk of EV in patients with cirrhosis. Ultimately, the findings of this study may enhance risk

assessment strategies, and facilitate personalized management approaches for patients with liver cirrhosis at risk of EV-related complications.

Materials and Method

The present observational analytical cross-sectional study was conducted among patients diagnosed with liver cirrhosis at the Department of Medicine, People's Hospital, Bhopal, associated with Peoples College Medical Sciences & Research Centre Bhopal over a period of 18 months. The study was commenced after obtaining ethical permission from the institutional ethical committee and written informed consent from patients. The inclusion criteria were all diagnosed cases of cirrhosis, regardless of cause, and age above 18 years. Exclusion criteria included cirrhosis with hepatic encephalopathy III/IV, critically ill patients, end-stage renal failure, hepatocellular carcinoma, and those who failed to give consent. The study variables included independent variables such as gender and cause of cirrhosis, and dependent variables like bleeding disorders, malaria, and dengue. Patients with liver cirrhosis presenting at PCMS & RC in the Department of General Medicine were considered for the study. All relevant information was collected and reconstituted into a structured performa for data analysis. All patients underwent laboratory investigations, including manual platelet count, Child-Pugh score, ultrasonography for spleen size and PV diameter, and UGIE. A correlation was attempted to be established to predict esophageal varices in cirrhotic patients. The data obtained was subjected to statistical analysis, compiled systematically, and presented in individual tables and graphs.

Results

Out of total participants, majority falling within the 51-60 age range, which accounts for 30.8% of the total participants. This is followed by the 41-50 age group, comprising 26.2% of the subjects. Participants aged 31-40 years make up 20.0% of the study population, >60 years comprised 15.4% ; <20 years make up 6.2% and 21-30 age make up 1.5%. A total of 65 patients were analyzed. Among these, 45 were male, accounting for 69.23% of the study population, while the remaining 20 were female, representing 30.77% (table 1). Out of 65 patients; 10 subjects (15.4%) were classified with Grade 1 varices, Grade 2 varices, were observed in 24 subjects (36.9%), Grade 3 varices were found in 16 subjects (24.6%). Only 1 subject (1.5%) was classified with Grade 4 varices (table 2). Table 3 demonstrates a statistically significant decline in mean platelet counts as the severity of varices increases, with an F value of 4.578 and a p-value of 0.003. Subjects with no varices had the highest mean platelet count at 203.00 $x10^3$/cu. mm (SD = 118.39). As varices severity increased to grade 1, the mean platelet count decreased to 152.30 $x10^3$/cu. mm (SD = 93.72). Further reductions in mean platelet counts were observed with grade 2 varices at 117.25 $x10^3$/cu. mm (SD = 47.19), grade 3 at 105.25 $x10^3$/cu. mm (SD = 37.53), and reaching the lowest mean platelet count of 23.00 $x10^3$/cu. mm for grade 4 varices.

Subjects without varices (grade 0) have a mean spleen size of 11.39 cm (SD = 2.08), while those with grade 1 varices exhibit a larger mean spleen size of 13.79 cm (SD = 2.56). For grades 2 and 3, the mean spleen sizes are 12.05 cm (SD = 1.84) and 12.63 cm (SD = 1.97), respectively. Subjects with grade 4 varices have a mean spleen size of 12.00 cm, though the standard deviation is not provided for this group. The F value of 2.208 and a p-value of 0.079 indicate that this difference is not statistically significant (table 4). The mean PV diameter for subjects without varices (Grade None) was 9.63 mm, with a standard deviation of 1.75. As varices grades progressed, there were slight fluctuations in the mean PV diameter, but the differences were not statistically significant based on the F value of 1.789 (p = 0.143). For Grade 1 varices, the mean PV diameter was 11.50 mm with a standard deviation of 3.58. Similarly, for Grade 2 varices, it was 10.10 mm with a standard deviation of 2.00, and for Grade 3 varices, it was 11.51 mm with a standard deviation of 3.13. Notably, for Grade 4 varices, the mean PV diameter was 8mm (table 5). The mean Child-Pugh score for subjects without varices (grade 0) was 9.00, with a standard deviation of 1.84. For subjects with grade 1 varices, the mean score was 8.60, with a standard deviation of 1.84; while for grade 2 varices, it was slightly lower at 8.42 with a standard deviation of 1.50. Subjects with grade 3 varices showed a slight increase in the mean score to 9.25 with standard deviation of 2.18. Score was 8 for subject with grade 4 varices. The F value of 0.632 and the corresponding p-value of 0.642 indicate that there were no statistically significant differences in mean Child-Pugh scores among the different varices grades (table 6). The analysis reveals a statistically significant difference among the groups (F value = 4.173, p = 0.005*). The mean PC/SD for subjects without varices (grade 0) was 1937.26 lakhs/cu.mm, with a standard deviation of 1441.24. For subjects with grade 1 varices, the mean was 1170.47lakhs/cu. mm, with a standard deviation of 835.37; while for grade 2 varices, it was 1007.47 lakhs/cu. mm with a standard deviation of 453.45. Subjects with grade 3 varices had mean of 875.17 lakhs/cu. mm with standard deviation of 387.68. Ratio was 191.67 lakhs/cu.mm for subject with grade 4 varices (table 7).

International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 9, September 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122
Doi-10.69605/ijlbpr_13.9.2024.100

Table 1: Age and Gender group wise distribution of study subjects

Parameters		Frequency	Percent
Age	**<20**	4	6.2
	21-30	1	1.5
	31-40	13	20.0
	41-50	17	26.2
	51-60	20	30.8
	>61	10	15.4
Gender	**Female**	20	30.77
	Male	45	69.23

Table 2: Varices Grade wise distribution of study subjects

Varices grade	Frequency	Percent
None	14	21.5
1	10	15.4
2	24	36.9
3	16	24.6
4	1	1.5

Table 3: Comparison of mean platelet count (x103/cu. mm)of study subjects according to varices grades

Varices grades	Mean	Std. Deviation	F value	p value
None	203	118.39	4.578	0.003*
1	152.3	93.72		
2	117.25	47.19		
3	105.25	37.53		
4	23			

Table 4: Comparison of mean spleen size (in cm) of study subjects according to varices grades

Varices grades	Mean	Std. Deviation	F value	p value
None	11.39	2.08	2.208	0.079
1	13.79	2.56		
2	12.05	1.84		
3	12.63	1.97		
4	12			

Doi-10.69605/ijlbpr_13.9.2024.100

Table 5: Comparison of mean PV diameter (in mm) of study subjects according to varices grades

Varices grades	Mean	Std. Deviation	F value	p value
None	9.63	1.75		
1	11.5	3.58		
2	10.1	2		
3	11.51	3.13		
4	8		1.789	0.143

Table 6: Comparison of mean child Pugh score of study subjects according to varices grades

Varices grades	Mean	Std. Deviation	F value	p value
None	9	1.84		
1	8.6	1.84		
2	8.42	1.5		
3	9.25	2.18		
4	8		0.632	0.642

Table 7: Comparison of mean platelet count (lakhs/cu mm)/spleen diameter (in mm) of study subjects according to varices grades

Varices grades	Mean	Std. Deviation	F value	p value
None	1937.26	1441.24		
1	1170.47	835.37		
2	1007.47	453.45		
3	875.17	387.68		
4	191.67		4.173	0.005*

Discussion

Esophageal varices are a significant complication of liver cirrhosis, leading to life-threatening bleeding.[6] Early detection and management are crucial to reducing morbidity and mortality.[7,8] Traditionally, endoscopy has been the gold standard for diagnosis, but its invasiveness and cost limit its availability.

Therefore, non-endoscopic predictors have been explored as simpler, more accessible alternatives. This study evaluates the accuracy of non-endoscopic predictors in diagnosing esophageal varices in patients with liver cirrhosis. The study's age distribution shows a majority of middle-aged to older adults, reflecting the typical age range for liver cirrhosis and associated complications. The gender distribution reveals a predominance of male subjects, suggesting a potential gender disparity in the prevalence of esophageal varices. The distribution of esophageal varices among the study subjects indicates a high prevalence, highlighting the importance of accurate non-endoscopic prediction methods. A significant decline in mean platelet counts as esophageal varices severity increases in liver cirrhosis patients (F value: 4.578, p-value: 0.003). Mean platelet counts decrease from 203.00 x10³/cu.mm (no varices) to 23.00 x10³/cu.mm (grade 4 varices), indicating an inverse relationship between platelet count and varices severity. This suggests platelet count as a potential non-endoscopic predictor for assessing variceal severity. Our results were consistent with those of Afsar, A. et al.[11]. The mean platelet count was 213,884.62/mm³ in patients with grade I varices, while it was 119,518.52/mm³, 58,386.49/mm³, and 21,600.00/mm³ in patients with grade II, III, and IV varices, respectively (p=<0.0001). There was a significant negative correlation between platelet count and the grades of esophageal varices (p<0.001). Patients with lower platelet counts tended to have higher grades of varices. Afsar and colleagues suggested that platelet count can be used as a predictor of the grades of esophageal varices, potentially reducing the need for frequent upper GI endoscopy. Haile Tesfaye Gebregziabiher et al.,[12] reported a mean platelet count of 89,350/mm³ with a standard deviation of ±59,780.37. Endoscopy and ultrasound parameters revealed that esophageal varices were present in 176 patients, accounting for 85.4% of the sample, while 30 patients, or 14.6%, did not have esophageal varices. Among those with esophageal varices, 89 patients, representing

Doi-10.69605/ijlbpr_13.9.2024.100

50.6%, had small varices, and 87 patients, or 49.45%, had large varices. This data highlights that a significant majority of the patients had esophageal varices, with an almost equal distribution between those with small and large varices. The mean platelet count, which is notably low, along with the high prevalence of esophageal varices. The present study reveals varying mean spleen sizes across grades, ranging from 11.39 cm (grade 0) to 13.79 cm (grade 1). However, the difference in spleen size among grades is not statistically significant (F value: 2.208, p-value: 0.079). This suggests that spleen size alone may not be a reliable non-endoscopic predictor of esophageal varices severity in liver cirrhosis patients. Amoako Duah et al.[13] conducted a study comparing the laboratory parameters of cirrhotic patients with and without oesophageal varices, involving a total of 149 patients. Among these, 135 had oesophageal varices, while 14 did not. One of the examined parameters was spleen size, measured in millimeters. The average spleen size for all patients was 138.28 ± 32.70 mm. Specifically, patients with oesophageal varices had an average spleen size of 138.80 ± 33.13 mm, whereas those without oesophageal varices had a slightly smaller average spleen size of 133.27 ± 28.80 mm. The p-value for this comparison was 0.5489, indicating no statistically significant difference in spleen size between the two groups. The present study compared mean portal vein (PV) diameter among subjects with different varices grades. The mean PV diameter ranged from 8.00mm (Grade 4) to 11.51mm (Grade 3), with a non-significant difference (F value: 1.789, p = 0.143). Although there were slight fluctuations in mean PV diameteracross grades, the variations were not statistically significant. This suggests that PV diameter alone may not be a reliable predictor of esophageal varices severity in liver cirrhosis patients, and further analysis is needed to explore other influencing factors. According to Suraj Uppalapati., Lokesh S.,[14] a portal vein diameter of more than 13 mm can be a non-invasive predictor of esophageal varices in patients with liver cirrhosis. Ahmed Salman et al.,[15] have found that a cut-off value of 12.5 mm or more can also be a good predictor. K.V.L. Sudha Rani et al.,[16] reported portal vein diameter > 13 mm can be considered as a non-invasive predictor of esophageal varices. Out of 65 patients with varices 12 patients have portal vein diameter < 13 mm. The present study examined mean Child-Pugh scores among subjects with different esophageal varices grades. The scores slightly fluctuated across grades, ranging from 8.00 (Grade 4) to 9.25 (Grade 3), but the differences were not statistically significant (F value: 0.632, p = 0.642). This suggests that the severity of esophageal varices may not significantly correlate with the Child-Pugh score, a marker of liver dysfunction in cirrhosis. Further investigation is needed to explore additional factors contributing to variations in Child-Pugh scores among cirrhotic patients with different grades of esophageal varices. Ahmed Salman et al.[15] compared Child scores and varices grades between two groups of patients. Group I, consisting of 200 patients with oesophageal varices, had 36% classified as Child score A, 37% as Child score B, and 27% as Child score C. In Group II, comprising 100 patients, 75% were classified as Child score A, 17% as Child score B, and 8% as Child score C, with a p-value of <.001, indicating significant differences between the groups. The varices grades in Group I were distributed as follows: 22.5% for Grade I, 28% for Grade II, 25.5% for Grade III, and 24% for Grade IV. Data for varices grades in Group II were not provided. The study compared mean platelet count to spleen diameter among subjects with different varices grades, revealing a statistically significant difference (F value = 4.173, p = 0.005). The mean platelet count decreases as varices grade increases, from 1937.26 lakhs/cu mm (no varices) to 191.67 lakhs/cu mm (grade 4 varices). This inverse relationship suggests that platelet count can serve as a non-endoscopic predictor of esophageal varices in liver cirrhosis, aligning with existing literature. In 2016, K.O. Akande et al. found a statistically significant difference in the mean platelet count and the platelet count/splenic size ratio between patients with large esophageal varices and those with small or no varices.[17]

Conclusion

In conclusion, platelet count and platelet count to spleen diameter ratio may be useful non-endoscopic predictors of esophageal varices in liver cirrhosis, while other parameters may not be reliable predictors. A statistically significant decline in mean platelet count as varices severity increases, with a significant difference among groups (F value = 4.578, p = 0.003). However, no significant differences were found in mean spleen size, portal vein diameter, and Child-Pugh scores among different varices grades. Notably, the mean platelet count to spleen diameter ratio showed a statistically significant difference among groups (F value = 4.173, p = 0.005), indicating its potential as a non-endoscopic predictor of esophageal varices. Further studies are needed to confirm these findings and explore additional non-endoscopic predictors.

References

1. D'Amico G, Garcia-Tsao G, Pagliaro L. Natural history and prognostic indicators of survival in cirrhosis: a systematic review of 118 studies. J Hepatol 2006; 44:217–31.

2. Qazi SA. Transabdominal gastro-esophageal devascularization and esophageal transection for bleeding esophageal varices after failed injection sclerotherapy: long-term follow-up report. World J Surg. 2006; 30:1329-37.

3. Child CG, Turcotte JG. Surgery and portal hypertension. In: Child CG, editor. The liver and portal hypertension. Philadelphia: W. B. Saunders Co., 1964; 50.

4. Angelo Zambam de Mattos, Larissa FaracoDaros and Angelo Alves de Mattos. Platelet count squared/spleen diameter-aspartate aminotransferase ratio: non- invasive method to predict esophageal varices. Arq Gastroenterol. 2017 July- September; 3(54):222-24.

5. Ehab AA Elatty, Elsayed I Elshayeb, Mohammed H Badr, Waleed AE Mousa, Mohammed F El Mansory. Noninvasive parameters for assessment of esophageal varices. The Egyptian journal of Internal Medicine. 2019;31:536-43.

6. Madhotra R, Mulcahy HEI, Willner I et al (2002) Prediction of esophageal varices in patients with cirrhosis. J Clin Gastroenterol 34(1):81–85

7. Walaa A. Elsalakawy, Ahmed G. El-Rab. Platelet count/splenic diameter ratio: a noninvasive method for diagnosis of esophageal varices in Egyptian cirrhotic patients. Egyptian Journal of Haematology. 2020 January-March; 1(45):28-34.

8. Chalasani N, Imperiale TF, Ismail A, Sood G, Carey M, Wilcox CM*, et al.* Predictors of large esophageal varices in patients with cirrhosis. Am J Gastroenterol. 1999 Nov;94(11):3285-91.

9. Ng FH, Wong SY, Loo CK, Lam KM, Lai CW, Cheng CS. Prediction of oesophagogastric varices in patients with liver cirrhosis. J Gastroenterol Hepatol. 1999 Aug;14(8):785-90.

10. Pilette C, Oberti F, Aubé C, Rousselet MC, Bedossa P, Gallois Y, *et al.* Non-invasive diagnosis of esophageal varices in chronic liver diseases. J Hepatol. 1999 Nov;31(5):867-73.

11. Afsar, A., Nadeem, M., Shah, S. A. A., Hussain, H., Rani, A., & Ghaffar, S. (2021). Platelet count can predict the grade of esophageal varices in cirrhotic patients: a cross-sectional study. *F1000Research*, *10*, 101.

12. Gebregziabiher HT, Hailu W, Abay Z, Bizuneh S, Meshesha MD. Accuracy of non-invasive diagnosis of esophageal varices among cirrhotic patients in a low-income setting. Heliyon. 2023 Dec 3;9(12):e23229.

13. Duah, A., Nkrumah, K. N., & Tachi, K. (2019). Non-invasive markers as predictors of oesophageal varices in cirrhotic patient in a teaching hospital in Ghana. *Ghana medical journal*, *53*(2) ,142–149

14. Suraj Uppalapati., Lokesh S.(2018). Correlation of portal vein diameter with the presence of oesophageal varices in chronic liver disease: a prospective study. International Journal of Advances in Medicine.Vol. 5 No. 4 (2018): July-August 2018

15. Ahmed Salman, Mohamed A. Salman, Amr M. Ismaeel Saadawy, Mohamed Tourky, Mohamed Shawkat.(2020).Advances in Digestive Medicine. Volume 8, Issue3, September 2021, Pages 146-154.

16. Rani KV, Sudarsi B, Siddeswari R, Manohar S. Correlation of portal vein size with esophageal varices severity in patients with cirrhosis of liver with portal hypertension. Int J Sci Res Publ. 2015;5(1):1-5.

17. Akande KO, Akere A, Otegbayo JA, Ola SO, Ousunmade D. Accuracy of non-endoscopic predictors of oesophageal varices in liver cirrhosis using platelet count, splenic size and portal vein diameter. Afr J Med Med Sci. 2016 Sep;45(3):243-251