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# PLATELET COUNT AND SPLEEN SIZE AS NON-INVASIVE PREDICTOR OF ESOPHAGEAL VARICES IN DECOMPENSATED CHRONIC LIVER DISEASE PATIENTS

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**Abstract**

*Objective: To determine the predictive value of non-invasive parameters (platelet count and spleen diameter) in determining esophageal varices in patients with Decompensated Chronic Liver Disease.*

*Study design: Cross sectional*

*Place & duration of study: The study will be carried out in the Department of Internal Medicine, Liaquat University of Medical and Health Sciences.*

*Methodology: In this cross-sectional study, 335 age 18-70 years of both genders, with an established diagnosis of (any severity) decompensated chronic liver disease had duration of disease <6 months participated. Every recruited patient had a thorough medical history, Blood samples were taken from all participants for CBC (to look for platelet count), LFTS and ultrasound abdomen was carried out to look at spleen size. Data analysis were done using SPSS Version 26. The quantitative variables were presented as mean ±SD. Frequencies & percentages were calculated for qualitative variables. Contingency table (2 x 2) was made to calculate sensitivity, specificity, PPV, NPV and diagnostic accuracy of non-invasive parameters keeping endoscopy as gold standard.*

*Results: The mean age of the patients was 57.82 + 10.22 years. Male female ratio was almost same. 167 (49.9%) were female and 168 (50.1%) were male. Most common indication was Ascites 226 (67.5%) and most common etiology of cirrhosis 142 (50.1%). the PPV, NPV, Sensitivity, specificity and diagnostic accuracy of platelet counts (a count of <150 platelets per microliter of blood) in predicting the esophageal varices in decompensated chronic liver disease patients was 74.5%, 75.1%, 67.8%, 68.3% and 71.3% respectively. Similarly, spleen size (more than 12 cm) had PPV, NPV, Sensitivity, specificity and diagnostic accuracy was 81.1%, 48.2%, 68.8%, 64.4% and 67.4% respectively.*

***Conclusion***: *Our study concluded that the platelet count and spleen size are accurate noninvasive method of assessing EVs in our patients with decompensated liver cirrhosis*

## INTRODUCTION

Liver cirrhosis is characterized by widespread fibrosis that affects the hepatic parenchyma and portal system and results in portal hypertension, which is indicated by an increase in pressure gradient above 10–12 mmHg in the portal and hepatic vein.[1] In cirrhotic individuals, portal hypertension causes a variety of clinical symptoms, the most feared of which is esophageal varices. Esophageal varices are present in 40% of patients with compensated cirrhosis and 60% of patients with decompensated cirrhosis, respectively, and are correlated with the severity of liver disease.[2]

Increased stress in the variceal wall associated with an increase in variceal size can cause the varices to rupture and cause potentially fatal bleeding.[3] The primary cause of morbidity and mortality in cirrhosis is esophageal variceal hemorrhage. Vasorectal bleeding occurs in 5–15% of cases, and in 30–40% of individuals with varices, life-threatening variceal bleeding can occur.[4] The majority of bleeding episodes are caused by esophageal varices; however, 10–36% of bleeding episodes are caused by stomach varices.[5] The size of the varices is the most significant predictor of variceal bleeding, and patients with big varices have the highest likelihood of experiencing their first hemorrhage. Even though treatment for esophageal varices has improved over the past ten years, up to 40% of patients still experience spontaneous bleeding, which is linked to a minimum of 20% death rate at six weeks.[6]

Endoscopy (EGD) is currently the gold standard technique for identifying these varices.[7,8] However, there are several disadvantages to endoscopy, including difficulties associated with the procedure, the requirement for intravenous sedation, and the expense of the procedure. These limitations have forced researchers to explore cutting-edge techniques for spotting varices.[9] There are many less invasive or non-invasive alternatives to endoscopy that have been proposed for screening patients for esophageal varices.[10]

The predictive value of various noninvasive markers has been studied extensively in the last two decades for the detection of esophageal varices. The emphasis is placed on these markers because of their simplicity, non-invasiveness, feasibility, easy interpretation and cost-effectiveness. Additionally, patients have been observed to be more inclined towards noninvasive methods than endoscopy.[10]

The present study is design to determine the diagnostic accuracy of non-invasive parameters (platelet count and spleen diameter) in determining esophageal varicesin patients with Decompensated Chronic Liver Disease.

Due to the shortage of endoscopes and endoscopists in government hospitals in resource-poor developing countries, endoscopy of every cirrhotic patient is not feasible in order to grade the esophageal varices and choose the patients for prophylactic medication. In order for endoscopists to prioritize choosing individuals at higher risk of bleeding for endoscopy, we must find non-invasive and trustworthy markers to predict the grades of esophageal varices in our community in Pakistan. Therefore, the present study is design to determine the predictive value of non-invasive parameters (platelet count and spleen diameter) in determining esophageal varices in patients with Decompensated Chronic Liver Disease. This study would assist regarding a better non-invasive parameter that has high accuracy for identifying esophageal varices.

**Methodology:**

This study was carried out over a period of six months (January to June, 2025) after the approval of research protocol from ethical review committee of the hospital (LUMHS/REC/574). After taking the written informed consent, a total of 335 patients of both genders with an established diagnosis of decompensated chronic had age 18-70 years with duration of disease <6 months were included via-non-probability sampling technique.

The exclusion criteria were: active variceal bleeding at admission, a history of endoscopic varicealsclerotherapy or band ligation, transjugular intrahepatic portosystemic stent shunt placement, a history of surgery for portal hypertension, medication use for primary prophylaxis of variceal bleeding, alcohol abuse, and thrombocytopenia due to causes other than hypersplenism. Demographic details, clinical history and physical examination of all patients' wa scarried out and accordingly findings were noted on a predesigned proforma. Blood samples was taken from all participants for CBC (to look for platelet count), LFTS and ultrasound abdomen was carried out to look at spleen diameter. After this, patients were then subjected to endoscopic evaluation for confirmation of esophageal varices. All endoscopies were performed by a single expert endoscopist who was blinded to the patient's data and all the findings will be noted down on the performa. Esophageal varices was diagnosed by the presence of expanded vessels in the esophagus as detected on Esophagogastroduodenoscopy (EGD) which is a gold standard. At endoscopy, the esophageal varices were graded as large (Grade III-IV) or small (Grade I-II), based on Paquet's grading system. On spleen size, maximum diameter between the spleen's two poles, which were measured in millimeters (mm) on ultrasound be considered enlarged (splenomegaly) if the spleen size was more than 12 cm. On platelet count, it was determined by carrying out a complete blood count and a count of <150 platelets per microliter of blood were labeled as thrombocytopenia. The data was analyzed using SPSS version 26.0. Mean and standard deviation were computed for quantitative data and frequency and percentages were calculated for qualitative data. Contingency table (2 x 2) was made to calculate sensitivity, specificity, PPV, NPV and diagnostic accuracy of non-invasive parameters keeping endoscopy as gold standard.

**Results:**

In this study, a total of 335 patients DCLD were included. The mean age of the patients was 57.82 ± 10.22 years. Male female ratio was almost same. 167 (49.9%) were female and 168 (50.1%) were male. Most common indication was Ascites 226 (67.5%) followed by jaundice119 (35.5%), hematemesis 170 (50.7%), melaena stool 113 (33.7%), pedal oedema 68 (20.3%), anorexia 65 (16.4%), weight loss 54 (16.1%) and HE 51 (15.2%). Hepatitis-C was found to as most common etiology of cirrhosis 142 (50.1%), then hepatitis-B in 110 (38.8%) cases and alcoholic in 4 (1.4%) cases. Around 21 (7.4%) patients had other causes of cirrhosis, **as shown in table#1**.

In current study, the PPV, NPV, Sensitivity, specificity and diagnostic accuracy of platelet counts (a count of <150 platelets per microliter of blood) in predicting the esophageal varices in decompensated chronic liver disease patients was 74.5%, 75.1%, 67.8%, 68.3% and 71.3% respectively. Similarly, spleen size (more than 12 cm) had PPV, NPV, Sensitivity, specificity and diagnostic accuracy was 81.1%, 48.2%, 68.8%, 64.4% and 67.4% respectively, **as shown in table#2 & 3**.

**Table#1: Demographic data of the patients**

| Demographic Data | n (%)/(mean ±sd) |
|---|---|
| Age (mean ±sd) | 57.82 ± 10.22 years |
| **Gender** | |
| • Female | 167 (49.9%) |
| • Male | 168 (50.1%) |
| **Indications of Cirrhosis:** | |
| • Ascites | 226 (67.5%) |
| • Jaundice | 119 (35.5%) |
| • Haematemesis | 170 (50.7%) |
| • Melaena stool | 113 (33.7%) |
| • Weight Loss | 54 (16.1%) |

| | |
|---|---|
| • Pedal oedema<br>• Hepatic encephalopathy<br>• Anorexia | 68 (20.3%)<br>51 (15.2%)<br>65 (19.4%) |
| **Etiology of Cirrhosis**<br>• Hepatitis-C<br>• Hepatitis-B<br>• Alcoholic<br>• others | 142 (50.1%)<br>110 (38.8%)<br>4 (1.4%)<br>21 (7.4%) |

**Table#2: Diagnostic Accuracy of Platelet Counts in Predicting the Esophageal Varices in Decompensated Chronic Liver Disease Patients**

| ESOPHAGEAL VARICES ON PLATELET COUNTS | ESOPHAGEAL VARICES ON ESOPHAGOGASTRODUODENOSCOPY | |
|---|---|---|
| | YES | NO |
| YES | 118 (TP) | 40 (FP) |
| NO | 56 (FN) | 121 (TN) |
| PPV | 74.6% | |
| NPV | 75.1% | |
| SENSITIVITY | 67.8% | |
| SPECIFICITY | 68.3% | |
| DIAGNOSTIC ACCURACY | 71.3% | |

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**Table#3: Diagnostic Accuracy of Spleen size in predicting the Esophageal Varices in Decompensated Chronic Liver Disease Patients**

| ESOPHAGEAL VARICES ON SPLEEN SIZE | ESOPHAGEAL VARICES ON ESOPHAGOGASTRODUODENOSCOPY | |
|---|---|---|
| | YES | NO |
| Yes | 159 (TP) | 37 (FP) |
| No | 72 (FN) | 67 (TN) |
| PPV | 81.1% | |
| NPV | 48.2% | |
| SENSITIVITY | 68.8% | |
| SPECIFICITY | 64.4% | |

| | |
|---|---|
| DIAGNOSTIC ACCURACY | 67.4% |

**Discussion:**

Between 25% and 35% of patients with cirrhosis may experience esophageal variceal hemorrhage. With a 6-week mortality rate of 15% to 25%, it poses a serious danger of death.[11]. The gold standard for identifying and classifying esophageal varices is endoscopy. Nevertheless, it is a limited-access invasive technique. If all patients with liver cirrhosis were required to have upper gastrointestinal endoscopies for screening on a regular basis, our health system would be overburdened financially and our resources would be exhausted. Therefore, developing noninvasive esophageal varices predictors that do not require upper gastrointestinal endoscopy for diagnosis is crucial. Numerous parameters have been investigated, and a great deal of work and research has been done in this area. Spleen size, portal vein diameter, platelet count to spleen size ratio, and Doppler tests of hepatic veins are a few of the parameters that have had some degree of success. These indicators necessitate frequently performed basic examinations, such as blood counts and ultrasounds, which do not place an additional load on the patient or the healthcare system.

The current investigation has established the diagnostic accuracy of increased spleen size and low platelet count as predictors of esophageal varices in patients with cirrhosis. Increased hepatic vascular resistance brought on by cirrhosis's scarring and fibrosis results in splenic congestion and splenomegaly. Additionally, this is how esophageal varices and portal hypertension arise.[12]As a result, the platelet count and spleen size are often lower in liver cirrhosis patients than in healthy people. This can be used to anticipate the occurrence of esophageal varices in a noninvasive way because it typically correlates with the length and severity of the condition.[13]

Thrombocytopenia in chronic liver disease has varying diagnostic accuracy, and for a more thorough evaluation, it is usually combined with other clinical and laboratory data.[14]

In current study, the PPV, NPV, Sensitivity, specificity and diagnostic accuracy of platelet counts (a count of <150 platelets per microliter of blood) in predicting the esophageal varices in decompensated chronic liver disease patients was 74.5%, 75.1%, 67.8%, 68.3% and 71.3% respectively. An Egyptian study has documented 39% sensitivity, 82% specificity, 72% PPV, 54% NPV and accuracy of 59% in liver cirrhosis patients platelet count less than 149000.[15] PC was considerably lower in cirrhotic patients with EVs than in patients without EVs, according to a cross-sectional research. With a PC cutoff value of less than 145.1, the presence of EVs could be predicted with 88% sensitivity, 100% specificity, 100% PPV, 80% NPV, and 92% diagnostic accuracy. Similar findings were found in studies conducted in Egypt, Uganda, and Côte d'Ivoire in Africa.16, 17 This is also consistent with several investigations conducted outside of Africa that mostly used a PC cutoff of less than 100 with different diagnostic accuracies, specificities, and sensitivities to predict the presence of EVs.[18-21]

The ability of splenic size and diameter to identify the presence of CSPH was found to be moderate. In the context of the platelet count/spleen diameter ratio, prior research has investigated spleen size by taking into account splenic diameter,22 which has demonstrated satisfactory repeatability. But as far as we are aware, only one other study has looked at spleen size as a possible non-invasive diagnostic metric.

In current study, spleen size (more than 12 cm) had PPV, NPV, Sensitivity, specificity and diagnostic accuracy was 81.1%, 48.2%, 68.8%, 64.4% and 67.4% respectively. Similar to the findings of the current study, According to Okon JB et al., the platelet count had a sensitivity of 52.4%, specificity of 82.4%, positive predictive value of 71%, and negative predictive value of 67.7% for esophageal varices, while the splenic diameter had a sensitivity of 66%, specificity of 57.5%, positive predictive value of 67.3%, and negative predictive value of 56.1%.[23]Another study by Gao L et al. found that the platelet count had a sensitivity of 51.9%, specificity of 74.6%, positive predictive value of 49.6%, and negative predictive value of 75.5%, while the splenic length had sensitivity, specificity, PPV, and NPV of 67.7%, 65.7%, 64%, and 82.2%. Spleen

size may be a helpful adjunct in predicting CSPH, as evidenced by the high repeatability observed in our investigation and the validation of comparable results in another study. To validate our findings, additional study with an external cohort is required.[24]

**Conclusion:**

In conclusion, the spleen size and platelet count are reliable noninvasive ways to measure EVs in our patients with decompensated liver cirrhosis. It is simple to compute and can lessen endoscopic units' hygienic and economical obligations, especially in underdeveloped nations. There should be more extensive multicenter researches on these predictors.

**Conflicts of interest**: No conflicts of interest exist.

**Ethical Declaration:** Approval was obtained from the ethical review committee of the hospital [LUMHS/REC/574]

**Patients' consent:** Written informed consent was provided by the patients

**Authors Contribution:**

**NA:** Design of the work, acquisition, analysis, interpretation of data and final approval

**AHK:** Drafting the work, final approval, revising it ethically

**MS:** Interpreted data and results

**LR:** Contributed to the abstract writing and references

**SH:** Provide resources for research work

**All authors approved the final version of the manuscript to be published**

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