



PLATELET INDICES AND NEUTROPHIL LYMPHOCYTE RATIO AS AN INFLAMMATORY MARKER FOR SPONTANEOUS BACTERIAL PERITONITIS IN CIRRHOTIC PATIENTS

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ABSTRACT **Background** To investigate whether platelet size alterations measured by Mean Platelet volume (MPV) and Platelet distribution width (PDW) along with Neutrophil lymphocyte ratio (NLR) would be useful in predicting Spontaneous bacterial peritonitis (SBP). **Materials and Methods** A Prospective study conducted in patients admitted in Department of Medical Gastroenterology, Coimbatore Medical College and Hospital between the age group of 18 to 60 who has decompensated cirrhosis with ascites of various etiology. The patients who had taken antibiotics within last 7 days and with other etiology for infection and co morbid illnesses were excluded. Diagnostic paracentesis was performed in all the patients for cell count, cytology, sugar, protein, albumin, culture & sensitivity and serum ascites albumin gradient. The diagnosis of SBP was made when at least 250 PMN/mm³ were present in ascitic fluid with positive ascitic fluid culture in the absence of secondary peritonitis and hemorrhagic ascites. The diagnosis of culture-negative neutrocytic ascites (CNNA) was made when >250 PMN/mm³ were present in ascitic fluid with negative ascitic fluid culture. Patients having SBP/CNNA on ascitic fluid analysis were taken as cases and patients without evidence of SBP/CNNA were taken as controls. Lab tests included Complete Blood Count with Platelet indices, Urine Routine examination, Blood Urea, Serum Electrolytes, Random Blood Sugar, Liver Function Tests, Renal Function Tests. **Results** In our study both cases and controls were age and sex matched. Among the cases and controls Whole blood count (11.24±1.75 vs 6.54±2.18), Neutrophil Lymphocyte ratio (5.83±1.6 vs 2.86±1.3 and Mean Platelet volume (8.85±0.82 vs 7.92±0.82) were high in cases and were statistically significant. Whereas Platelet distribution width (16.4±1.4 vs 14.9±1.2) was not statistically significant. **Conclusion** Based on the results of our study Neutrophil Lymphocyte ratio and Mean Platelet volume can be used as a marker for predicting Spontaneous bacterial peritonitis (SBP) and early administration of antibiotics in these patients will prevent mortality and morbidity.

KEYWORDS : Spontaneous Bacterial peritonitis, Neutrophil Lymphocyte ratio, Mean platelet volume, Platelet distribution width.

INTRODUCTION

Liver cirrhosis is the clinical end stage of chronic liver disease due to which patients suffer from considerable mortality and morbidity. Ascites is the most common complication, and around 60% of patients with compensated cirrhosis develop ascites within 10 years of disease onset¹. Spontaneous bacterial peritonitis (SBP) is a major cause of morbidity and mortality in cirrhotic patients with ascites. SBP is estimated to affect 10–30% of cirrhotic patients hospitalized with ascites, and mortality in this group approaches 30%². Many of these patients are asymptomatic, and it is therefore recommended that all patients with ascites undergo paracentesis at the time of admission to confirm the SBP status³. Although SBP is less prevalent in an outpatient setting, it is reasonable to also evaluate the ascitic fluid of outpatients because of the high mortality associated with SBP.

Platelets are considered an important source of pro-thrombotic agents associated with inflammatory markers, and play a role in the initiation and propagation of vascular and inflammatory diseases⁴. Platelets with large sizes have many granules that can exert their hemostatic and pro-inflammatory actions with greater efficiency. For these reasons, the mean platelet volume (MPV) and platelet distribution width (PDW) may be considered indicators of platelet function and activation⁵. MPV and PDW are routine tests that are a part of a complete blood count. An increase in MPV has been observed in chronic viral hepatitis because of an increase in the entry of newly produced platelets into circulation, which are larger in volume than the old platelets⁶.

SBP is an inflammatory state and inflammatory markers are notably stimulated in SBP despite the low ascitic fluid bacterial concentration. In patients with SBP, inflammatory markers such as interleukin-6, tumor necrosis factor- α and α -1-antitrypsin have been observed to be elevated in various studies⁷. NLR is a simple parameter to easily assess the inflammatory status of a subject. It has been suggested as a marker of systemic inflammation and shows the relationship between two different immune pathways. The neutrophil count reflects ongoing inflammation, whereas the lymphocyte count represents the immune regulatory pathway.

NLR has also been found to be raised in cirrhosis, as cirrhosis is an inflammatory state due to various etiologies like, impaired bacterial clearance by liver due to sinusoidal fibrosis, dysbiosis, leaky gut and release of ligands from necrotic hepatocytes, termed as damage-associated molecular patterns (DAMPs)^{8,9}. There is also derangement of innate and adaptive immunity due to effects of cirrhosis on each cell line individually and reduced expression of MHC class II proteins^{8,10}. This leads to a variation in NLR ratio in cirrhosis. Association of NLR with the severity of fibrosis of liver due to various etiologies and in predicting the outcome has been well documented in various studies^{11,12}.

SBP being an inflammatory complication of cirrhosis with ascites, NLR and Platelet indices a marker of inflammation if found associated with SBP can become a less invasive marker to diagnose SBP in cirrhosis.

AIMS AND OBJECTIVES

The aim of this study was to investigate whether platelet size alterations measured by Mean Platelet volume (MPV) and Platelet distribution width (PDW) with Neutrophil Lymphocyte ratio (NLR) would be useful in predicting Spontaneous Bacterial Peritonitis.

MATERIALS AND METHODS

Study design - Prospective observational study

Study duration - 1 year (APRIL 2022–APRIL 2023)

Study population-Every patient with cirrhosis and ascites who was admitted to our department during the one year.

Sample size- 100

Inclusion criteria

- All patients with clinical findings and investigation reports suggesting Liver cirrhosis with ascites between 18 to 60 years.
- The diagnosis of SBP was made on the basis of the presence of at

least 250 cells/ml polymorphonuclear leukocyte (PMN) in the ascitic fluid, with or without positive ascitic fluid culture in the absence of hemorrhagic ascites and secondary peritonitis.

Exclusion criteria

- Patients less than 18 and more than 60 years
- Patients with other causes of Infections (Respiratory tract infection, Urinary tract infection)
- Patients with comorbid illnesses (Heart failure, thyroid disorders, Neoplastic disorders, Hypertension, Diabetes mellitus)
- Patients who had received antibiotics within the last 7 days or were on antibiotic prophylaxis for SBP.

METHODOLOGY

A Prospective study conducted in patients admitted in Department of Medical Gastroenterology, Coimbatore Medical College and Hospital between the age group of 18 to 60 who has decompensated cirrhosis with ascites of various etiology as proven on ultrasound abdomen, were evaluated with a detailed history and examination to rule out any infection other than SBP (like Urinary tract infection, Pneumonia etc.), malignancy, autoimmune diseases, obesity or any other chronic systemic disease like DM, COPD, CKD, CAD, HIV, etc. The patients who had taken antibiotics within last 7 days or were on antibiotic prophylaxis for SBP were excluded from the study. Diagnostic paracentesis was performed in all the patients for cytology (TLC/DLC), sugar, protein, albumin, culture/sensitivity and serum ascites albumin gradient (SAAG). The diagnosis of SBP was made when at least 250 PMN/mm³ were present in ascitic fluid with positive ascitic fluid culture in the absence of secondary peritonitis and hemorrhagic ascites. The diagnosis of CNNA was made when >250 PMN/mm³ were present in ascitic fluid with negative ascitic fluid culture. Patients having SBP/CNNA on ascitic fluid analysis were taken as cases and patients without evidence of SBP/CNNA were taken as controls. Both cases and controls underwent routine physical examination including BMI, laboratory testing and X-ray chest. Lab tests included Complete Blood Count with Platelet indices, Urine Routine examination, Blood Urea, Serum Electrolytes, Random Blood Sugar, Liver Function Tests, Renal Function Tests. We used a cut off value of NLR >3.4, MPV >8.77fL and PDW 17.8fL as a marker to diagnose SBP^{13,14}.

Statistical analysis

Data collected was entered into MS Excel spreadsheet and was analyzed with SPSS 20.0 software

RESULTS

After the admission and diagnosis of Liver cirrhosis with ascites, patients were evaluated for SBP. 50 patients with SBP/CNNA were taken as cases and 50 patients without evidence of SBP/CNNA were taken as controls.

Patients had Liver cirrhosis of different etiology (Table 1). Of 100 cases diagnosed with Cirrhosis 53 had Ethanol related cirrhosis, 23 had Chronic Hepatitis B virus related cirrhosis, 13 had Chronic Hepatitis C virus related cirrhosis, 11 had Nonalcoholic steatohepatitis related cirrhosis and 1 had autoimmune hepatitis related cirrhosis. According to the Child-Turcotte-Pugh score, 65 (65.3%) patients were classified as stage B and 35 (34.7%) patients were classified as stage C. Model for end-stage liver disease scoring of the studied groups ranged from 11 to 19 (Table 1).

Table 1- Baseline characteristics of patients with Cirrhosis

Parameters	Number of Patients (n=100)
Etiology of cirrhosis	
Ethanol related	53
Chronic hepatitis B	23
Chronic hepatitis C	12
Non-Alcoholic steatohepatitis	11
Autoimmune Hepatitis	1
Child-Turcotte-Pugh class	
Child A	0
Child B	65
Child C	35
MELD Score	13(11 to 19)

The mean age of the cases was 48 and the controls was 45, there was no statistical significance (Table 2). The males and female among the

cases were 39/11 and controls were 35/15 and there was no statistical significance (Table 2). Thus, two groups were matched for age and sex. In this study hemoglobin, bilirubin, platelets and PDW there were no significant difference between cases and control group (Table 2). There was significant increase in the values of WBC, NLR and MPV in the cases group than the control group.

Table 2- Demographic and laboratory parameters of the studied groups

	Cases(n=50)	Control (n=50)	P-value
Age(years)	48	45	NS
Sex(M/F)	39/11	35/15	NS
Hemoglobin	9±0.5	9.5±1.2	NS
WBCs (103/cmm)	11.24±1.75	6.54±2.18	<0.05
Platelets (103/cmm)	93±25	102±29	NS
Bilirubin(mg/dL)	1.75±0.77	1.52±0.59	NS
MPV (fL)	8.85±0.82	7.92±0.82	<0.05
PDW (fL)	16.4±1.4	14.9±1.2	NS

In this study comparison of the markers NLR, MPV and PDW between cases and controls showed statistically significant values for NLR and MPV, whereas PDW was insignificant (Table 3)

Table 3- Comparison of Neutrophil Lymphocyte Ratio and Platelet Indices in patients with and without SBP.

	Cases(n=50)	Control (n=50)	P-value
NLR	5.83±1.6	2.86±1.3	<0.05
MPV (fL)	8.85±0.82	7.92±0.82	<0.05
PDW (fL)	16.4±1.4	14.9±1.2	NS

DISCUSSION

Ascites is commonly found in patients with liver cirrhosis and may promote bacterial translocation, increasing the risk of SBP [3]. SBP in outpatients is rare, but when it occurs, it often requires hospitalization to manage the disease [4]. SBP is considered to result from a combination of factors inherent in cirrhosis and ascites, such as prolonged bacteremia secondary to compromised host defenses, intrahepatic shunting of colonized blood, and defective bactericidal activity within the ascitic fluid [10]. We used a cut off value of NLR >3.4, MPV >8.77fL and PDW 17.8fL as a marker to diagnose SBP^{19,20}. In this study comparison of the markers NLR, MPV and PDW between cases and controls was done. It showed statistically significant values for NLR and MPV between cases and controls (5.83±1.6 vs 2.86±1.3 and 8.85±0.82 vs 7.92±0.82) respectively and they were according to the cut off value used in the aforementioned studies^{19,20}. Whereas PDW was insignificant between cases and control group.

CONCLUSION

Based on the results of our study Neutrophil Lymphocyte ratio and Mean Platelet volume can be used as a marker for predicting Spontaneous bacterial peritonitis (SBP) in Liver cirrhotic patients with ascites. Early administration of antibiotics in these patients will prevent mortality and morbidity since there is a delay in obtaining Ascitic fluid studies and culture reports.

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