

## Original Article

# A Study on Correlation between SAAG and Platelet Count: Spleen Size Ratio for the Prediction of Esophageal Varices among Chronic Liver Disease Patients

<sup>1</sup>Dr Javed Sayyed, <sup>2</sup>Dr Deepti Sharma, <sup>3</sup>Dr Kavita Choudhary, <sup>4</sup>Dr S R Meena, <sup>5</sup>Dr Pallavi Vij,  
<sup>6</sup>Dr Mukesh Verma

<sup>1</sup>Junior Specialist Medicine, CHC Ratangarh, Churu

<sup>2</sup>Professor, Department of Medicine, Government Medical College, Kota, Rajasthan, India

<sup>3</sup>Assistant Professor, Department of Community Medicine, Govt Medical College, Churu, Rajasthan

<sup>4</sup>Senior Professor and HOD, Department of Medicine, Government Medical College, Kota, Rajasthan, India

<sup>5</sup>Resident, Department of Medicine, Government Medical College, Kota, Rajasthan, India

<sup>6</sup>Resident, Department of Medicine, Government Medical College, Kota, Rajasthan, India

Corresponding author: Dr Kavita Choudhary

### Abstract:

**Introduction:** In developing countries like India where the burden on health institution is more, the screening of esophageal varices by Endoscopy has high cost and secondarily it is an invasive procedure that leads to more patient's discomfort. So, we planned a study undertaken to determine the correlation and association between the level of SAAG and platelet count /spleen size ratio for the prediction of esophageal varices (EV) found on upper gastrointestinal endoscopy.

**Material & Method :** A study of CLD patient's with ascites attending evidenced by abdominal USG & liver profile, age between 18 to 65 years with no previous diagnosis of esophageal varices was carried out. Platelet count, spleen size, SAAG and platelet count spleen size ratio was determined and endoscopy was done.

**Observations:** In our study out of 100 CLD patients 78 patients had esophageal varices. The results showed that SAAG cut off of  $\geq 1.5$  had 77.60% of sensitivity. A platelet count/spleen size ratio cut off value of 929 had sensitivity of 74.10% and when SAAG and Platelet count/ Spleen size ratio is used simultaneously the Net sensitivity becomes 94.1%.

**Conclusion** - Combined high SAAG and low platelet count/ spleen size ratio are non invasive parameters with very high sensitivity (94%) for Esophageal varices in CLD patients and thus helpful in identifying the patients for early referral for endoscopy.

**Key Words:** SAAG, CLD, Endoscopy

### Introduction:

Cirrhosis is a condition that is defined histopathologically and has a variety of clinical manifestations and complications. Some of them can be life threatening if not diagnosed at the right time. The patients with advanced cirrhosis can develop portal hypertension and later gastroesophageal variceal hemorrhage, splenomegaly and ascites. (1) Variceal hemorrhage is an immediate life-threatening problem with a 20-30% mortality with each episode of bleeding. (1) The Serum Ascites Albumin Gradient (SAAG) is a minimally invasive method with high

precision.(2,3) Several studies on cirrhosis emphasized that SAAG is a factor which determines the degree of portal hypertension as well as prognosis of the patients with cirrhosis due to alcohol.(4,5) Hypersplenism with thrombocytopenia is usually the first indication of portal hypertension. The decreased platelet count may depend on several factors other than portal hypertension like shortened platelet mean life time, decreased thrombopoietin production or myelotoxic effects of alcohol or hepatitis virus.(6) In order to eliminate other causes for decreased platelet count in cirrhosis patients, platelet count/spleen size ratio has been used as a parameter linking thrombocytopenia to spleen size in order to introduce a separate variable that takes into consideration the decrease in platelet count which most likely depends on hypersplenism due to portal hypertension.(7) Routine endoscopy of all cirrhotic patients with or without varices has health services cost implications. It might be cost effective to identify those patients who require endoscopy by routine non-invasive screening. (3,8)

In developing countries like India where the burden on health institution is more, the screening of esophageal varices by Endoscopy has high cost and secondarily it is an invasive procedure that leads to more patient's discomfort. Previous studies have been done on SAAG as well as on platelet count /spleen size (diameter) ratio for the prediction of esophageal varices. These are non invasive and more cost effective procedures. But very few studies covered both the SAAG and platelet count /spleen size ratio for the prediction of esophageal varices. So, we planned a study undertaken to determine the correlation and association between the level of SAAG and platelet count /spleen size ratio for the prediction of esophageal varices (EV) found on upper gastrointestinal endoscopy.

**Objective:** To study correlation of esophageal varices with SAAG and Platelet count/ Spleen size ratio in patients of Chronic Liver disease.

**Material and methods:**

The present study has been carried out on patients of chronic liver disease admitted in medicine ward at Govt Medical College, Kota, Rajasthan from January 2015 to November 2015.

After obtaining permission from the institutional ethics committee; we included 100 patients in the age group 18-65 years having Chronic liver disease with ascites as evidenced by: abdominal ultrasound and liver profile derangement. We excluded patients with other causes of ascites, patients operated for portal hypertension, on treatment with beta blockers, nitrates and diuretics, who have received platelet transfusion within the last one month, those with known causes of thrombocytopenia other than cirrhosis and patients with known causes of splenomegaly other than cirrhosis. Purpose of this study was explained to the study subject and their relatives and written consent was taken. The concentration of albumin in serum and ascitic fluid was determined by using Bromcresol Green method simultaneously with these results SAAG was calculated. Platelet count (no. of platelets/ $\mu$ L) was performed by 6 part differential fully automated cell counter as well as manual method. Abdominal ultrasonography was carried out with SEIMENS SONOLINE G60S using transducer 3-5 MHz to determine spleen size as bipolar diameter in millimeter. Endoscopy was performed by expert endoscopist by using PENTAX video-endoscope to evaluate the presence of esophageal varices. Results were tabulated and conclusion was made on the basis of results of study after applying Chi square test, Pearson's Correlation Coefficient and ROC curve.

**Observations:**

Table:1 Demography of study population

Study variable	Frequency	Percentage
Age groups		
18-30	13	13%
31-45	47	47%
46-60	26	26%
61-65	14	14%
Total	100	100%
Sex		
Male	74	74%
Female	26	26%
Total	100	100%
Etiology		
Alcoholic	49	49%
Autoimmune	2	2%
Hbs Ag	8	8%
Alcoholic- Hbs Ag	1	1%
Not known	40	40%
Total	100	100%

Table 1 show that maximum patients were in 31 to 45 years of age group. Mean age at presentation was 44.6±12.7 years. Males were three times more than females and alcohol was the most common cause of chronic liver disease.

Fig 1. ROC of SAAG :

SAAG cut off value was calculated by ROC as 1.5 that gave 77.6% sensitivity (max.) and 66.6% specificity (max.)

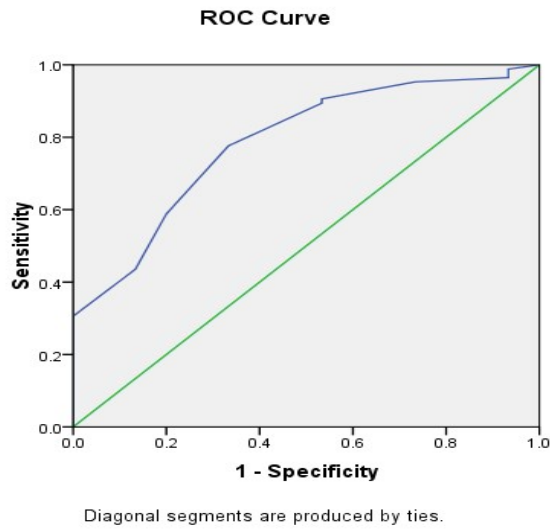
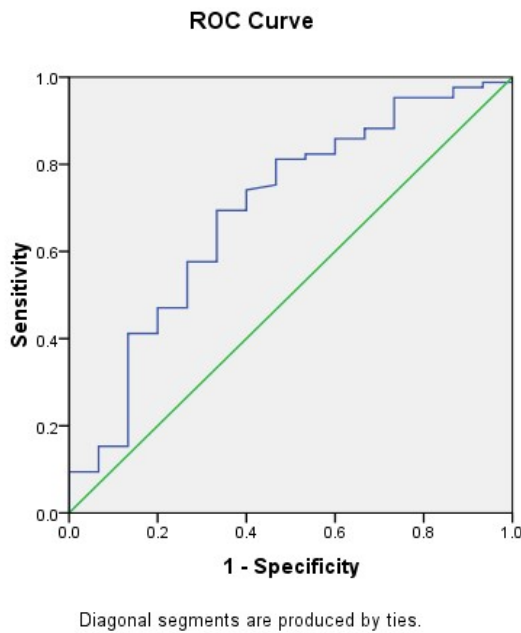


Fig 2 ROC of platelet count/spleen size:



The cut off value of platelet count/spleen size was calculated as 929 to get maximum sensitivity (74.1%) and maximum specificity (60%)

Table 2: Correlation of SAAG with Esophageal varices

Esophageal varices	Mean SAAG	P value
Yes	1.62±0.27	0.001**
No	1.35±0.26	

Table 2 shows statistically significant difference between the mean SAAG values of those who had the varices from those who did not.

Table3. Correlation of Platelet count/ spleen size with Esophageal varices

Esophageal varices	Mean Platelet count/ spleen size	P value
Yes	804.13±661.0	0.018**
No	1291.92±1006.7	

Table 3 shows statistically significant difference between the means of Platelet count/ spleen size of those who had varices as compared to those who did not.

Table4. Distribution of study population according to Endoscopic findings:

Endoscopic findings	Frequency	Percentage
Esophageal varices present	78	78%
Esophageal varices absent	22	22%
Total	100	100%

Table 4 shows that through endoscopy 85% patients found to have esophageal varices.

Fig3. Fig: Comparison of Sensitivity of SAAG, Platelet count/ spleen size, SAAG+ Platelet count/ spleen size

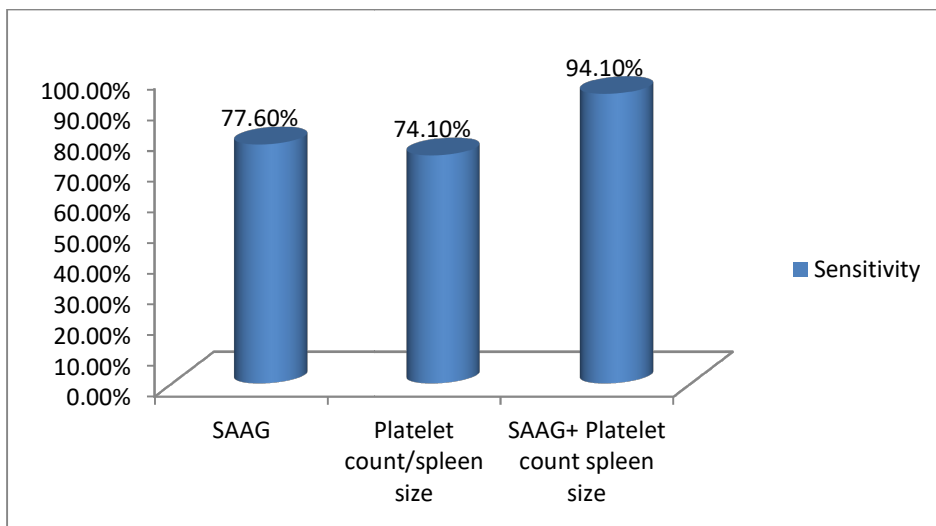


Fig 3 shows that the SAAG alone is 77.60% sensitive and platelet count/spleen size ratio is 74.10% sensitive in predicting esophageal varices. The sensitivity was 94.10% if both SAAG and platelet count/spleen size ratio were used simultaneously.

### **Discussion:**

In present study the maximum patients were young and the similar finding was observed by Entesar H El-Sharqawy et al (9) and Arulprakesh sarangpani et al (10) in their studies. In our study maximum patients were males and alcohol consumption was the most common etiology. Similar findings were observed by other studies. (11,12) This could be explained by the fact that males are more prone for alcohol consumption. In present study all patients underwent endoscopy and nearly 2/3 patients had esophageal varices and similar results were obtained by Waqas Wahid Baig and Alenjandro Gonzalez et al in their studies. (12, 13) To calculate the cut off value of SAAG we used Receiver-Operating-Characteristic Curve and it gave maximum sensitivity and maximum specificity at SAAG value of 1.5. We found significant correlation between SAAG and esophageal varices. Similar results were obtained by other studies also. (14,15). From this finding we can interpret that in CLD patients SAAG can help in predicting esophageal varices. We also used the Receiver-Operating-Characteristic Curve to interpret the cut off value for platelet count/ spleen size ratio in our study and cut off value of 929 gave maximum sensitivity and specificity. It showed that platelet count/ spleen size ratio is also a good predictor of esophageal varices. While comparing the sensitivity of SAAG, Platelet count /spleen size ratio and SAAG plus Platelet count /spleen size ratio for predicting esophageal varices in CLD patients it was found that combining these two non invasive parameters in subgroup with ascites increases the reliability of predicting esophageal varices. Thus simultaneous use of these parameters helps in identifying patients with a high probability of having esophageal varices without performing endoscopy. This may also help reduce costs and discomfort for these patients and the burden on endoscopy units.

### **Conclusion:**

Combined high SAAG and low platelet count/ spleen size ratio are non invasive parameters with very high sensitivity (96%) for predicting Esophageal varices in CLD patients and thus helpful in identifying the patients for early referral for endoscopy.

### **References:**

- (1) Harrison's Principles of Internal Medicine 18<sup>th</sup> Edition chapter 308 page 2592-2597
- (2) Runyon BA, Montano AA, Akriviadis AA, Antillon MR, Irving MA, Mc Hutchison JG. The Serum Ascites Albumin Gradient is superior to the exudates – transudate concept in the diagnosis of ascites. *Ann Intern Med.* 1992;117:215-20.
- (3) Gurubacharya DL, Mathura KC, Karki DB. Correlation between serum ascites albumin concentration gradient and endoscopic parameters of portal hypertension. *Kath Uni Med J* 2005;3:327-33.
- (4) Pare P, Talbot J, Heofs JC. Serum ascites albumin gradient: a physiologic approach to the differential diagnosis of ascites. *Gastroenterol* 1983;85:240-4.
- (5) Torres E, Barros P, Calmet F. Correlation between serum-ascites albumin concentration gradient and endoscopic parameters of portal hypertension. *Am J Gastroenterol.* 1998; 93 (11):2172-8.
- (6) De Franchis R. Revising consensus in portal hypertension: report of the Baveno V consensus workshop on methodology of diagnosis and therapy in portal hypertension. *J Hepatol.* 2010;53:762–768.

- (7) E Giannini, Botta F, Borro P et al: Platelet count/spleen diameter ratio: proposal and validation of a non invasive parameter to predict the presence of oesophageal varices in patients with liver cirrhosis. *Gut* 2003; 52:1200-05.
- (8) Hoef JC. Serum protein concentration and portal pressure determine the ascitic fluid protein concentration in patients with chronic liver disease. *J Lab Clin Med* 1983; 102: 260-273.11.
- (9) Entesar H El-Sharqawy MD, Reda El-Badawy MD, Eman M Fathy MD, Ibrahim El Attar MD and Hosam Amin MD 2003 Department of Hepatology, Gastroenterology and Infectious Diseases, Faculty of Medicine, Benha University, EGYPT.
- (10) Arulprakash Sarangapani, Chitra Shanmugam, Muthukumaran Kalyanasundaram, Balamurali Rangachari, Pugazhendhi Thangavelu, Jeevan Kumar Subbarayan Saudi *J Gastroenterol.* 2010 Jan-Mar; 16(1): 38–42.
- (11) Demirel U., Karıncaoglu M., Hapıluoglu M., et al.; (2003): Two findings of portal hypertension: Evaluation of correlation between serum-ascites concentration gradient and esophageal varices in non-alcoholic cirrhosis. *Turkish J. Gastroenterol.* ; 14: 219-222.
- (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.* 2008;22(10):825–8.
- (13) Alejandro González-Ojeda, Gabino Cervantes-Guevara, Manuela Chávez-Sánchez, Carlos Dávalos-Cobián, Susana Ornelas-Cázares, Michel Dassaejv Macías-Amezcuca, Mariana Chávez-Tostado, Kenia Militzi Ramírez-Campos, Anaís del Rocío Ramírez-Arce, and Clotilde Fuentes-Orozco *World J Gastroenterol.* 2014 Feb 28; 20(8): 2079–2084
- (14) Das B.B., Purohit A., Acharya U., and Utreskova E. (2001): Serum-ascites albumin gradient: a predictor of esophageal varices with ascites. *Indian J. Pediatrics*; 68: 511-514
- (15) Enas Allam, Dalia Ghoraba, Sara Abdelhakam, Wesam A Ibrahim. Correlation between serum-ascites albumin gradient and esophageal varices in patients with portal hypertension. *sciencepub* 2011;3(8):39-49.