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Original Research Article

Study of Correlation of Serum Ascitic Albumin Gradient with Oesophageal Varices in Chronic Liver Disease Patients

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Conflict of interest: Nil

Abstract

Background: Cirrhosis of the liver is at risk of developing oesophageal varices and variceal bleeding, which are associated with a high mortality rate; the correlation between SAAG and oesophageal varices in portal hypertension due to cirrhosis of liver helps predict the prognosis and severity of the disease, including the rate of mortality.

Method: Out of 62 (sixty-two) adult patients with newly diagnosed cirrhosis of the liver studied with endoscopy to rule out upper GIT varices and USG to find out the size of the spleen and the diameter of the portal vein. Blood examination (CBC, LFT, RFT, coagulation profile) and Child-Pugh score to calculate grades and severity. Diagnostic paracentasis was performed to study cell count, protein, albumin and culture.

Results: Out of 62 cases, 43 (69.3%) had the presence of varices; the highest grade was II (18 (41.8%)), followed by grade I (14 (32.5%)). The association of SAAG with oesophageal varices and factors associated with oesophageal varices had a significant p-value ($p<0.001$).

Conclusion: Correlation between SAAG and oesophageal varices with chronic liver patients with portal HTN is a predictor of severity of disease and mortality.

Keywords: Endoscopy, Child-pugh Scores, SAAG, Portal Hypertension.

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Introduction

The liver is the largest metabolic centre in the body. Cirrhosis is the final stage of chronic liver disease. Ascites and oesophageal varices are the most common complications of portal hypertension (PTH) with an incidence of approximately 50% [1].

Since effective modalities have been established for variceal haemorrage, early detection of oesophageal haemorrage is critical for primary prevention of bleeding.

Upper gastrointestinal endoscopy (UGE) remains the gold standard for screening [2]. Since oesophageal varices (EV) are an independent predictive factor and an early complication of cirrhosis. The test should be repeated during the follow-up of patients with cirrhosis without EV, who are at risk of bleeding with or without the decompensation UGE procedure, which is expensive, invasive and restrictive [3]. Such a screening test should be simple, rapid, reproducible and inexpensive.

The serum ascites albumin gradient (SAAG) is a minimally invasive method that is precise and has already been described in the classification of ascitic fluid based on the absence or presence of portal hypertension (PTH) [4]. Hence, an attempt is made to study SAAG in the newly diagnosed cirrhosis of the liver in adults to evaluate the risk factors of bleeding and mortality.

Material and Method

62 (sixty-two) adult patients aged between 20 and 65 years with newly diagnosed liver disease admitted at Shahid Nirmal Mahto Medical College Hospital (SNMMCH), Dhanbad-826005,

Jharkhand, India, were studied.

Inclusive Criteria: The patients are above 18 years. Newly diagnosed cases of liver disease with ascitis confirmed by physical examination, biochemical parameters, and ultrasound abdomen. The patients who gave their consent in writing for the study were selected.

Exclusion Criteria: Patients with pregnancy, bleeding from existing portal hypertension, having AIDS, or being currently on beta-blockers were excluded from the study.

Method

Concerned medical history and clinical examination were carried out in every patient. Blood samples were collected for routine investigation, including complete blood count (CBC), liver function test (LFT), renal function test, and coagulation profile. Child-Pugh scores were calculated for disease severity assessment. Diagnostic paracentesis was performed under aseptic conditions; ascetic fluid was analyzed for cell count, protein, albumin, and culture. Serum samples were obtained on the same day as paracentesis for SAAG calculation.

Upper gastrointestinal endoscopy was performed by a gastroenterologist blinded to SAAG (serum ascites albumin gradient) results. Esophageal varices were graded according to the Paquet classification (Grade-0: No varices, Grade-I small varices without protrusion, and Grade-II moderate-sized varices with minimal protrusion). Grade III: large varices substantially protruding; Grade IV: very large varices occluding the lumen. Abdominal ultrasonography assessed liver echogenicity, spleen size, portal vein diameter, and collaterals. The duration of the study was March 2026 to September 2026.

Statistical Analysis: Clinical manifestations, co-morbidities, presence and absence of varices, and grading of oesophageal varices were classified with percentage association of SAAG with oesophageal varices; factors associated with oesophageal varices were compared with a t-test, and a p-value was recorded. The statistical analysis was carried out in SPSS software; the ratio of male and female was 2:1.

Observation and Results

Table-1: Clinical manifestations of patients with portal hypertension (HTN) in chronic liver disease: 57 (91.9%) alcoholic liver disease, 5 (8.06%) chronic hepatitis, co-morbidities, 17 (27.4%) hypertension (HTN), 14 (22.5%) type-II DM, 3 (4.8%) COPD, 1 (1.6%) CAD, and 13 (20.9%) had an absence of morbidities.

Table-2: Endoscopic findings and laboratory parameters.

- Oesophageal varices – 43 (69.3%) had a presence of varices, and 19 (30.6%) had an absence of varices.
- Grading of oesophageal varices: out of 43, 14 (32.5%) were grade-I, 18 (41.8%) were grade-II, 7 (16.2%) were grade-III and 4 (9.7%) were grade-IV.
- Laboratory parameters – 2.74 (±0.26) serum albumin (g/dL), 1.68 (±0.26) SAAG (g/dL), 1.6 (±0.25) INR.
- Child-Pugh classification – 16 (25.8%) class-A, 28 (45.1%) class-B and 18 (29%) class-C.

Table-3: Association of SAAG with oesophageal varices

- Presence of varices 43 (63.3%) had 1.68 (±0.3 g/dL), and absence of varices 19 (30.6%). The p-value was highly significant.
- Grading of oesophageal varices: 14 (32.5%) had grade-I, 1.2 (±0.26) SAG mean value: 18 (41.8%) had grade-II, 1.3 (±0.24) SAG mean value, 7 (16.2%) had grade-III, 1.8 (±0.26) SAAG mean value, and 4 (9.30%) had grade-IV, 1.92 (±0.20) SAAG mean value.

Table 4: Factors associated with oesophageal varices.

- 41 (95.3%) had alcoholic liver disease; 2 (4.65%) had chronic hepatitis.
- Child-Pugh classification – 8 (18.6%) class-A in the presence of varices; 8 (42.1%) had the absence of varices. 22 (51.6%) had class-B presence of varices, 5 (26.3%) had absence of varices, 13 (30.2%) had class presence, and 6 (31.5%) had absence of varices.
- Moreover, the highest prevalence of varices was 26 (60.4%) observed in the age between 41-60 years, followed by 11 (25.5%) in the age range of 20-40 years.

Table 1: Clinical manifestations of patients with portal HTN in chronic liver disease [Total patients = 62]

Manifestations	Frequency (62)	Percentage %
Alcoholic liver diseases	57	91.9%
Chronic hepatitis	5	8.06%
Co-morbidities		
a. Hypertension	17	27.4%
b. Diabetes Mellitus	14	22.5%
c. COPD	3	4.8%
d. CAD	1	1.61%
Absence of co-morbidities	13	20.9%

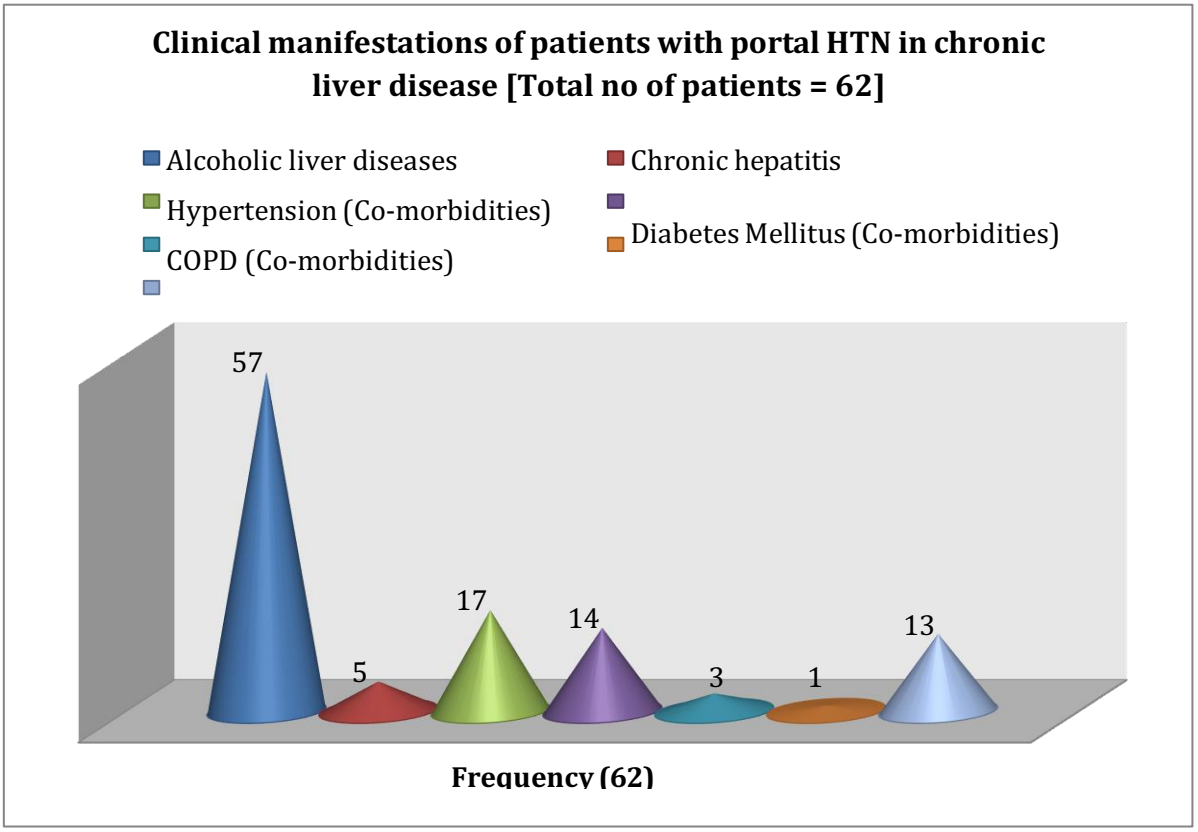


Figure 1: Clinical manifestations of patients with portal HTN in chronic liver disease [Total no of patients = 62]

Table 2: Endoscopic finding and laboratory parameters [Total no of patients = 62]

Endoscopic findings	Value
A) Oesophageal varices	
1. Present	43 (69.3%)
2. Absent	19 (30.6%)
B) Grading Oesophageal varices (43)	
1. Grade – 1	14 (32.5%)
2. Grade – 2	18 (41.8%)
3. Grade – 3	7 (16.2%)
4. Grade – 4	4 (9.7%)
C. Laboratory parameters mean value (±SD)	
1. Serum albumin (g/dL)	2.74 (±0.26)
2. Bilirubin (mg/dL)	2.46 (±0.73)
3. SAAG (g/dL)	1.68 (±0.26)
4. INR	1.60 (±0.25)
D) Child-pugh classification	
1. Class – A	16 (25.8%)
2. Class – B	28 (45.1%)
3. Class – C	18 (29%)

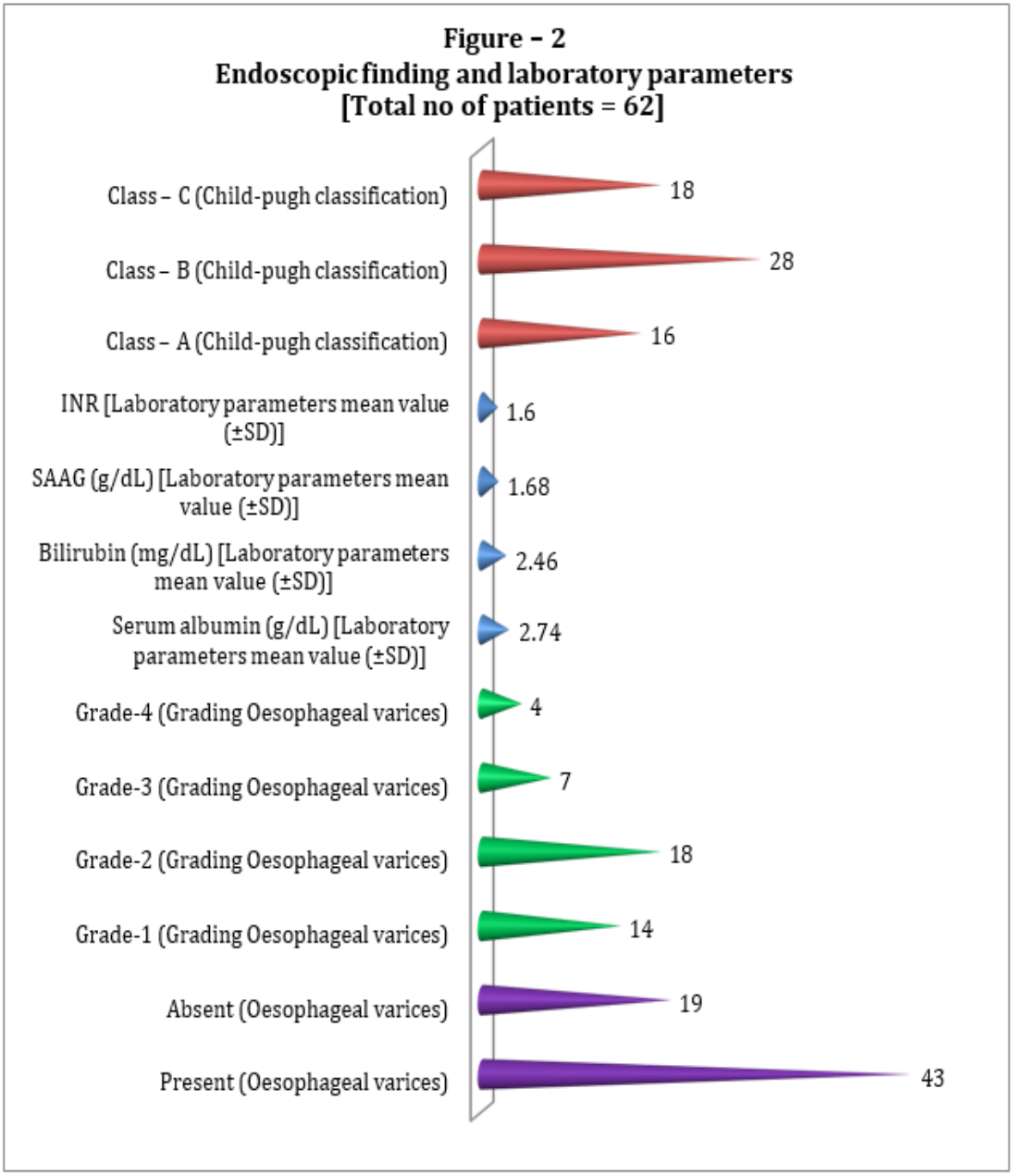


Figure 2:

Table 3: Association of SAAG with esophageal varices

Parameters	SAAG mean value (SD)	P-value
Presence of oesophageal varices		
Present (No-43) Absent (No-19)	1.68 (±0.3 g/dL) 1.2 (±0.3 g/dL))	P<0.001 --
Grading of oesophageal varices		
Grade-I (No-14) (32.5%)	1.2 (±0.26)	P<0.001
Grade-II (No-18) (41.8%)	1.3 (±0.24)	--
Grade-III (No-7) (16.2%)	1.8 (±0.26)	--
Grade-IV (No-4) (9.3%)	1.92 (±0.20)	--

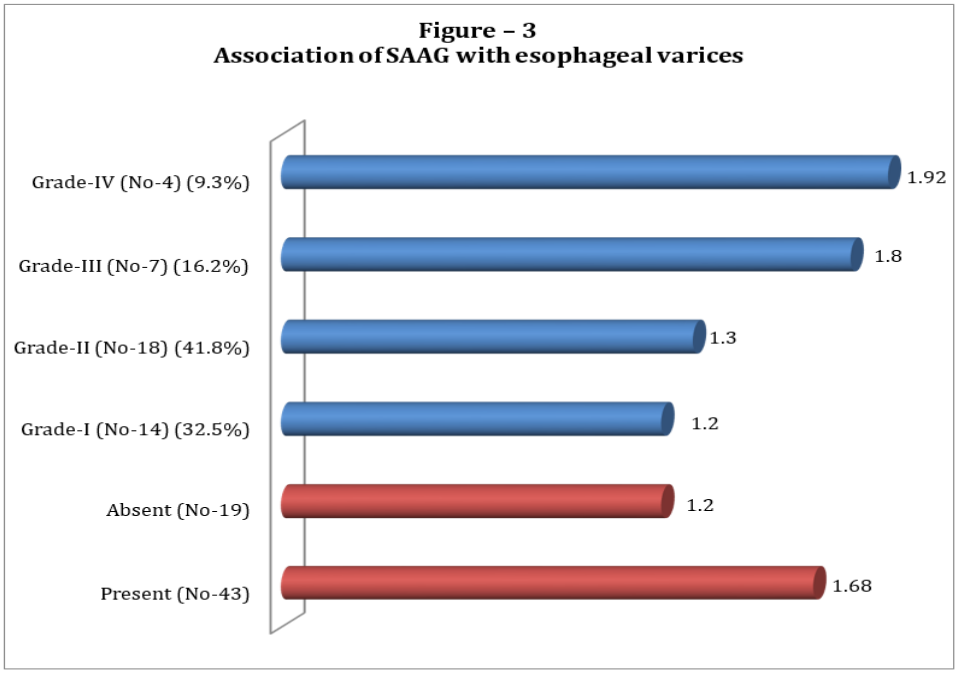


Figure 3:

Table 4: Factors associated with oesophageal varices

Etiology	Presence of varices (43)	Absence of Varices (19)	p-value
Alcoholic liver disease	41 (95.3%)	15 (78.9%)	p>0.05
Chronic hepatitis	2 (4.65%)	4 (21%)	--
Child-pugh classification Class – A Class – B Class – C	 8 (18.6%) 22 (51.6%) 13 (30.2%)	 8 (42.1%) 5 (26.3%) 6 (31.5%)	p>0.22

Moreover, highest prevalence of varices 26 (60.4%) observed in 41-60 years of age flowed by 11 (25.5%) in the age group of 20-40 years of age.

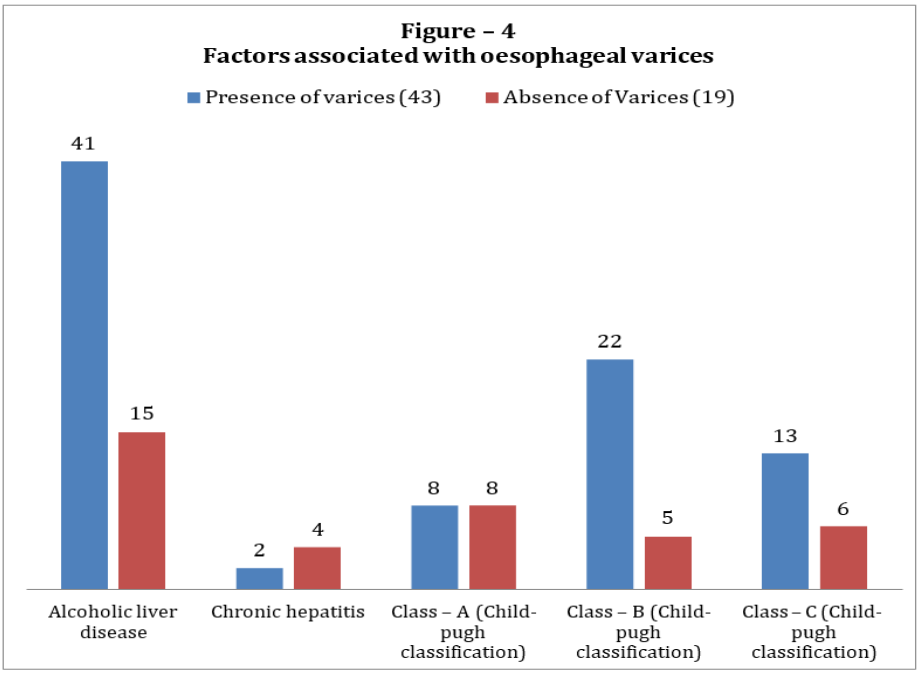


Figure 4:

Discussion

In the present study of the correlation of serum ascetic albumin gradient with oesophageal varices in chronic liver disease patients, the clinical manifestations were 57 (91.9%) who had alcoholic liver disease and 5 (8%) who had chronic hepatitis. The co-morbidities were 17 (27.4%) who had hypertension, 14 (22.5%) who had diabetes mellitus, 3 (4.8%) who had COPD, and 1 (1.6%) who had CAD (Table 1). The endoscopic findings and laboratory parameters were that 43 (69.3%) had oesophagitis varices, 14 (32.5%) had grade-I, 18 (41.8%) had grade-II, 7 (16.2%) had grade-III, and 4 (9.7%) had grade-IV. The laboratory parameters included serum albumin (g/dL) – 2.74 (±0.26), bilurubin (mg/dL) – 2.46 (±0.73), SAAG (g/dL) – 1.68 (±0.26) INR, and 1.6 (±0.25). Child-Pugh classification – 16 (25.8%) class-A, 28 (43.1%) class-B, 18 (29%) class-C (Table-2). The association of SAAG with oesophageal varices parameters had significant p-values ($p<0.001$) (Table-3). Factors associated with oesophageal varices, viz., alcoholic liver disease, chronic liver disease, and Child-Pugh classification, had a significant p-value ($p<0.001$) (Table-3). The highest prevalence of varices, 26 (60.4%), was observed in the 41-60-year-old age group, followed by 11 (25.5%) in the 20-40-year-old age group. These findings are more or less in agreement with previous studies [5,6,7].

Albumin is the most important protein synthesised by the liver; normally the body can produce approximately 15 g of albumin per day. Albumin synthesis has been reported to decrease to approximately 4 gm per day in child-pugh class-C group patients with cirrhosis [8].

High SAAG (1> /gm /dL) indicates the presence of portal hypertension, which is detected by observing portal hypertensive changes in the upper gastrointestinal tract. Direct portal pressure measurement is an invasive and labour-intensive procedure, so minimal invasive endoscopy helps to detect the development of portal hypertension by observing the changes in the upper GIT [9]. There is a correlation between SAAG and portal hypertensive changes in the upper GIT in cirrhosis of liver patients with ascites. It is also reported that a similar correlation between SAAG and portal pressure had significant pressure ($r=0.80$), which has a significant p-value ($p<0.001$), which indicates oesophageal varices with portal hypertension in upper GIT in cirrhosis patients [10].

It is also suggested that Runyon's criteria for ascetic fluid analysis, which emphasises SAAG as a superior diagnostic tool over traditional methods such as total protein concentrator, have been widely validated for varices in the upper GIT in cirrhosis of liver patients [11].

Summary and Conclusion

The present correlation of SAAG with oesophageal varices in patients with portal hypertension in chronic liver disease patients with cirrhosis of the liver leads to the development of oesophageal varices due to portal hypertension; it leads to upper GIT bleeding and mortality.

Hence, a high ratio of SAAG (>1%) indicates the grades of varices, which is an indicator of portal hypertensive changes. Hence, it is an important non-invasive tool to detect EV in a selected group of patients to avoid undergoing an expensive, unnecessary endoscopic procedure. Such studies must be conducted in a large number of patients to validate present findings and results because there is no tool or technique to record the accurate degree of portal hypertension.

Limitation of study: Owing to the remote location of the research center, small number of patients, and lack of the latest techniques, we have limited findings and results.

This research work is approved by the Ethical Committee of Shahid Nirmal Mahto Medical College Hospital (SNMMCH), Dhanbad-826005, and Jharkhand, India.

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