

## Research Article

# Comparative utility of biochemical markers for differential diagnosis of ascites

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### ABSTRACT

**Background:** Ascites is pathological accumulation of free fluid in the peritoneal cavity. Appropriate management for ascites depends upon diagnosis of its etiology. Based on total protein concentration of ascitic fluid, earlier ascites was classified as transudate and exudate. The present study was designed to compare the utility of total protein, lactate dehydrogenase (LDH) and serum ascites albumin gradient (SAAG) to categorise ascitic fluids as either exudate or transudate.

**Methods:** This prospective study comprised of 110 adult patients with ascites whose diagnosis was established by clinical examination and appropriate investigations. Biochemical analysis of ascitic fluid and serum was done with protein, albumin and LDH. The usefulness of each biochemical parameters was statistically evaluated in terms of sensitivity, specificity, accuracy, PPV and NPV.

**Results:** In this endeavour, the SAAG and fluid LDH did showed a clear advantage over the fluid protein which is traditional existing biochemical parameter for differential diagnosis of ascitic fluid into transudate and exudate.

**Conclusions:** The SAAG had more discriminatory power than fluid protein parameter and hence should replace fluid protein test in diagnostic separation of ascites into transudate and exudate.

**Keywords:** Ascites, Protein, Lactate dehydrogenase, Serum ascites albumin gradient

### INTRODUCTION

The etiological classification of ascites is a common clinical problem. By traditional classification, if fluid protein in more than 3 gm% then it is exudate and if fluid protein is less than 3 gm%, it is transudate. However, upto 25% of ascites cases due to uncomplicated liver cirrhosis shows protein levels >3 gm%. Ascites in cases of malignancy can present with low protein concentration.<sup>1</sup> Thus, several discrepancies occur due to this traditional classification. The correct diagnosis of ascites as transudative or exudative origin is important for proper clinical diagnosis and further management.<sup>1,2</sup> Several studies have been carried out in the past with the help of biochemical markers like protein, albumin, LDH,

etc. The present study was undertaken to identify biochemical marker for differentiating ascitic fluid into transudate and exudate by using the parameters like fluid protein, fluid LDH and serum ascites albumin gradient (SAAG).<sup>1-3</sup>

### METHODS

The hospital based prospective study was conducted over the period of 6 months. The study comprised of 110 adult patients with different causes of ascites. All the cases were clinically diagnosed and confirmed by radiological and laboratory investigations. After confirming the diagnosis of patients of cirrhosis, tuberculosis, malignancy, nephrotic syndrome, anaemia

hypoprotinaemia and spontaneous bacterial peritonitis were included in this study.

With utmost aseptic precaution, ascitic fluid and blood samples were collected from patients at the same time. The estimation of total protein, albumin, LDH was done on ascitic fluid. Serum was analysed for albumin estimation and SAAG values calculated. The protein, albumin and LDH were estimated by biurate method, bromocresol green method and modified IFCC method respectively.<sup>4</sup> Serum ascites albumin gradient (SAAG) is defined as difference between serum and ascitic fluid albumin concentrations.<sup>1,2</sup>

#### *The ascitic fluid diagnosis as exudate as per following criteria*<sup>1-3,5,6</sup>

Fluid protein > 3 gm%, fluid LDH > 200 U/L and SAAG <1.1

Data was analysed and interpreted using SPSS software for sensitivity, specificity, accuracy, positive predictive value (PPV) and negative predictive value (NPV) of various laboratory parameters.

## RESULTS

In this study, total 110 ascitic fluids were studied. Of the 110 patients, 83 were males and 27 were females. Their

age groups ranged from 25 to 60 years. Cirrhosis was found to be the most common cause of ascites (70.9%).

**Table 1: Categorization of fluids based on diagnosis.**

Diagnosis	Transudate	Exudate
Liver cirrhosis	78	--
Nephrotic syndrome	05	--
Anaemia-hypoprotinaemia	12	--
Tuberculosis	--	05
Malignancy	--	06
Spontaneous bacterial peritonitis	--	04
Total	95	15

Considering the etiological diagnosis, 15 fluids were exudates and 95 fluids were transudates (Table 1). The transudates consists the cases of cirrhosis, nephrotic syndrome and anaemia-hypoprotinaemia. Exudates consists the causes of tuberculosis, malignancy and subacute bacterial peritonitis.

With the cut off value of 3 gm/dl, the parameter fluid protein showed sensitivity, specificity and accuracy of 60%, 64.21% and 63.63% respectively. The parameter fluid LDH (cut off value 200 U/L) had sensitivity, specificity and accuracy of 80%, 86.31% and 85.45% respectively. The parameter SAAG (cut off value 1.1gm/dl) had sensitivity, specificity and accuracy of 86.66%, 89.47% and 89.09% respectively (Table 2).

**Table 2: Diagnostic validity of various biochemical parameters.**

Parameter	Cut off value	SEN.	SPECI.	ACCU.	PPV	NPV
Fluid protein	3 GM%	60%	64.21%	63.63%	20%	91.04%
Fluid LDH	200 IU/L	80%	86.31%	85.45%	48%	96.47%
SAAG	1.1 GM%	86.66%	89.47%	89.09%	56.52%	97.7%

(Sen. = Sensitivity, Speci. = Specificity, Accu. = Accuracy, PPV= Positive Predictive Value, NPV= Negative Predictive Value).

## DISCUSSION

The term ascites was first coined by 'Treviso' in 1888. Ascites represent the pathological collection of fluid in the peritoneal cavity. Common causes of ascites include liver cirrhosis, tuberculosis, nephrotic syndrome, anaemia-hypoprotinaemia, congestive cardiac failure.<sup>4-6</sup>

Traditionally, ascites has been classified as being either transudate or exudate based upon ascitic fluid total protein concentration. However, ascitic fluid protein (cut of 3 gm/dl) yielded poor sensitivity and frequent misclassification.<sup>1</sup> Thus, the differential diagnosis of ascites is a common clinical problem. The proper differentiation as transudate or exudate is important for further diagnostic and therapeutic procedures and treatment. Hence several components of ascitic fluid were tested for their differential diagnostic usefulness.<sup>4,5</sup>

Ascitic fluid total protein concentration depends upon alteration of permeability of peritoneal membrane during the inflammatory process. The fluid total protein concentration is directly proportional to colloidal osmotic pressure and serum protein concentration.<sup>6</sup>

Fluid lactate dehydrogenase (LDH) levels are increased due to increase permeability of peritoneum in inflammatory conditions and due to increased glycolytic activity or overproduction of enzymes by tumor cells. The cut off value of 200U/L was used to differentiate between transudates and exudates.<sup>3,7</sup>

In contrast to the concept of transudates and exudates, serum ascitic albumin gradient (SAAG) has been proposed as physiologically based alternative to categorise the fluids in much better way, as SAAG is influenced by only one variable-portal pressure. Poor

accuracy of fluid total protein concentration in classifying the fluids can be explained by its dependence on multiple factors.<sup>6</sup>

SAAG is calculated as difference between serum and ascites albumin concentration consequently. Patients with SAAG value of 1.1 gm/dl or more have portal hypertension and have transudative effusions, while SAAG values <1.1 gm/dl are found in patients with normal portal pressure and have exudative effusion.<sup>4,6</sup>

The present study results demonstrated that the parameter fluid total protein (cut off value 3 gm/dl) had lowest accuracy of 63.63% as compared to other parameters. Basaran GS et al and Paramothayan et al had showed that fluid LDH is a better parameter than others to differentiate fluids into transudate and exudate.<sup>3,7</sup> However in the present study, we found that SAAG (accuracy 89.09 %) is the better parameter than fluid LDH (accuracy 85.45%).

The present study showed that the SAAG has more discriminative power than fluid protein and fluid LDH to differentiate the ascitic fluid into transudates and exudates. The results of this study showed that SAAG is an excellent discriminator in differential diagnosis of ascites as it has a sensitivity of 86.66%, specificity of 89.47% and accuracy of 89.09%. Other workers have observed similar utility (Malabu UH et al, Ingle et al, Sulya M et al.<sup>1,2,4</sup> Presently, SAAG is included for the initial evaluation of ascitic fluids by American Association of study of Liver Disease (AASLD) and British Society of Gastroenterology.<sup>4</sup>

## CONCLUSION

The present study data have shown that the determination of SAAG is most useful in differentiating ascites into transudates and exudates. In view good diagnostic efficiency and cost effectiveness, SAAG is excellent

parameter than other biochemical parameters in investigating ascitic patients.

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