# Serum-Ascites Albumin Gradient (SAAG) Interpretation

The serum ascites albumin gradient (*SAAG*) is a formula that is used to assist in determining the cause of ascites.

Ascites is an abnormal accumulation of fluid within the (peritoneal) cavity. One of the most common liver diseases is caused by cirrhosis of the liver but it can also be caused by other diseases.

One of the tests done in patients who present with ascites is serum albumin levels and ascitic fluid albumin levels. These values are then used to calculate Serum-Ascites Albumin Gradient.

## Calculation and Interpretation of SAAG.

**Serum-Ascites Albumin Gradient** refers to the difference in albumin concentrations between serum and ascites as a reflection of imbalances in hydrostatic and oncotic pressures. Therefore the serum-ascites albumin gradient (SAAG) is a formula used to assist in determining the potential causes of ascites.

The formula for calculation of SAAG is:-

SAAG = Serum albumin levels- Ascites Albumin levels

Normally, the ascitic fluid albumin level is always less than the serum level with SAAG < 1.1g/dL. This is because serum oncotic pressure counterbalanced by serum hydrostatic pressure. When the albumin level is low in the ascitic fluid, the gradient, or difference between the ascites and the serum, is high.

When this gradient, or Serum-Ascites Albumin Gradient (SAAG), is **more than 1.1 g/dL**, portal hypertension, as from cirrhosis, is generally the cause suggesting a nonperitoneal cause of ascites. When the SAAG is <1.1 g/dL, it means the ascitic fluid albumin level is high.

## Interpretation of SAAG findings

Serum–ascites albumin gradient (SAAG) and protein levels are key to distinguish ascites of different causes.

Majority of the patients who have liver cirhosis develop ascites with a low protein concentration known as transudate. there protein levels are less than <25 g/L (2.5 g/dL)) and relatively few cells but in some cases, the total protein concentration is more than 3.0 g/dL. In circumstances like these, determining SAAG is key. A gradient of >11 g/L (1.1 g/dL) is 96% predictive that ascites is due to portal hypertension.

In an exudate acites or high protein ascites, the SAAG is less than 11 g/L (1.1 g/dL) with a high protein concentration of more than 2.5 g/dL. This is a finding in infection especially tuberculosis, cancers and pancreatic ascites.

Venous outflow obstruction due to heart failure or hepatic venous outflow obstruction can also cause a transudative ascites, as indicated by an albumin gradient of >11 g/L (1.1 g/dL) but, unlike in cirrhosis, the total protein content is usually >25 g/L (2.5 g/dL).

## Conditions with high SAAG >1.1g/dL are:-

- Liver cirrhosis
- Protein-losing enteropathy,
- Nephrotic syndrome
- Malnutrition
- Hepatic vein obstruction
- Veno-occlusive disease
- Malignancy
- Fulminant hepatic failure
- Myxedema
- Portal hypertension

## Conditions with SAAG of <1.1 g/dL .

A low SAAG indicates nonportal hypertension suggesting a peritoneal cause of ascites.

These conditions are:

- Tuberculous peritonitis,
- systemic lupus erythromatosus
- Primary peritoneal mesothelioma
- Secondary peritoneal carcinomatosis
- Parasitic and fungal infections,
- Sarcoidosis
- Eosinophilic gastroenteritis,
- Whipple disease
- Endometriosis
- Henoch-Schonlein purpura and foreign bodies such as cotton.

Albumin values should be measured at the same time.