

## Causes and Pathophysiology of Ascites

Ascites is the abnormal accumulation of fluid in the peritoneal cavity. Normally, men have minimal to no peritoneal fluid, whereas women may have up to 20 mL depending on menstrual cycle phase. When fluid volume exceeds one liter, clinical features of ascites become apparent.

### Common Causes of Ascites

Ascites can arise due to several underlying conditions, primarily through mechanisms involving:

- **Increased portal venous pressure (portal hypertension)**
- **Hypoproteinemia (low plasma proteins, mainly albumin)**
- **Chronic peritoneal irritation/inflammation**
- **Leakage of lymphatic fluid into the peritoneal cavity (chylous ascites)**
- **Fluid overload**

### 1. Increased Portal Venous Pressure

Pre-hepatic causes:

- Portal vein compression (e.g., tumors)
- Portal vein thrombosis
- Schistosomiasis

Hepatic causes:

- Liver cirrhosis (most common cause)
- Acute hepatic necrosis
- Viral hepatitis

Post-hepatic causes:

- Budd-Chiari syndrome (hepatic vein thrombosis)
- Myeloproliferative disorders
- Constrictive pericarditis
- Right heart failure
- Hypercoagulable states

### 2. Hypoproteinemia

Reduced plasma oncotic pressure due to low albumin promotes fluid leakage into the peritoneal space.

Causes include:

- Nephrotic syndrome (severe proteinuria)
- Malnutrition and malabsorption
- Protein-losing enteropathy
- Acute and chronic liver disease
- Severe acute or chronic illnesses

### 3. Chronic Peritoneal Inflammation or Infection

- Tuberculosis peritonitis
- Fungal infections
- Carcinomatosis peritonei (malignant infiltration of peritoneum, common with gastric and ovarian cancers)
- Post-irradiation peritoneal damage

### 4. Leakage of Lymphatic Fluid (Chylous Ascites)

- Congenital lymphatic abnormalities
- Surgical trauma to lymphatics
- Primary or secondary malignancies blocking lymphatic drainage

### 5. Other Causes

- Pancreatic ascites (due to pancreatic duct leakage)
- Bilious ascites (bile leakage)
- Urinary ascites (urinary tract rupture)

## Pathophysiology

### Portal Hypertension and Ascites Formation

- **Increased intrahepatic resistance** (due to cirrhosis or hepatic vein obstruction) raises portal venous pressure.
- This increases hydrostatic pressure in portal veins and hepatic sinusoids, pushing fluid out into interstitial spaces.
- Collateral vein formation and splanchnic vasodilation increase portal venous inflow and lymph production.
- The lymphatic system becomes overwhelmed, resulting in fluid leaking into the peritoneal cavity.

### Hemodynamic Changes

- Splanchnic vasodilation reduces effective arterial blood volume.
- This triggers activation of the **renin-angiotensin-aldosterone system (RAAS)**, causing **renal sodium and water retention**.
- Sodium retention worsens fluid accumulation despite systemic volume overload.

### Hypoalbuminemia

- Decreased albumin synthesis in liver disease lowers plasma oncotic pressure.
- Reduced oncotic pressure fails to draw fluid back from interstitial spaces into circulation.
- This promotes net fluid leakage and accumulation in the peritoneum.

## Malignant Ascites

- Peritoneal carcinomatosis causes inflammation, increased vascular permeability, protein-rich exudation, and bleeding.
- Common with cancers like gastric and ovarian carcinomas spreading transperitoneally.

## Peritoneal Inflammation

- Infections or irritation increase capillary permeability and lymphatic fluid exudation.
- When lymphatic absorption capacity is exceeded, ascites develops.

## Lymphatic Leakage

- Trauma or obstruction to lymphatics results in chylous ascites with high triglyceride content.

## Diagnostic Clues and Differentiation

- Ascites must be differentiated from other causes of abdominal distension (e.g., bowel obstruction, hemorrhage, large masses).
- Analysis of ascitic fluid protein and **serum-ascites albumin gradient (SAAG)** helps classify ascites etiology:
  - **High SAAG (>1.1 g/dL)** : Portal hypertension-related ascites (cirrhosis, heart failure, Budd-Chiari).
  - **Low SAAG (<1.1 g/dL)** : Non-portal hypertension causes (peritoneal carcinomatosis, infection).

## Risk Factors for Developing Ascites

- Chronic heavy alcohol use (leading to alcoholic cirrhosis)
- Chronic viral hepatitis (HBV, HCV)
- Intravenous drug use
- High-risk sexual behavior
- Blood transfusions with unscreened blood
- Tattoos
- Residency in hepatitis endemic areas
- Obesity, hypercholesterolemia, type 2 diabetes (nonalcoholic steatohepatitis)
- History of abdominal or peritoneal malignancy