

# **A review on effect of portal hypertension on hepatic failure and its epidemiology**

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## **Abstract**

Liver disorders and failure of liver is the major concern of health care providers and a point of debate since last decade. Both acute and chronic liver failure leads to death and there are a number of factors that cause liver failure portal vein hypertension is a one of the most common cause of liver failure. Portal vein is the major vessel supplying blood to the liver and it has blood pressure of approximately is 5 to 10 mmHg. And an increase in pressure causes rupturing of the parenchyma of liver which further leads to damage hepatocytes and cause their death which is the major reason behind liver failure. Diagnosis is done by various invasive or non-invasive techniques and as that to check the level and the disease stage. Few treatment options are present either to remove the damaged part or to transplant liver with the donor or cloned liver.

**Keywords:** Disorder, Failure, Pressure, Portal vein, Hepatocytes, Invasive

## **Introduction:**

Portal vein acts as a major supporter of hepatic vascular supply about 3 times its required arterial blood. Liver sinusoids consist of a system like the hepatic artery and doorway vein which is evacuated by centrilobular veins. The portal venous structure comprises the portal vein and its tributaries – namely the splenic and mesenteric veins. The blood contains all the nutrients absorbed in the GI tract, but it also takes impurity that the liver breaks down so that they can be safely discharged by the kidneys[1]. So, any condition that makes injury liver parenchyma consequently results in injury to the portal vein running adjacent to it. That results in continuous injury to hepatocytes that are due to drug intake, viral hepatitis alcohol abuse, etc.

These in the long run led to Portal Hypertension: increased blood flow through the portal vein because of resistance caused by changes in liver parenchyma-like scarring[1][2]. The operational definition is made as the clinical findings that show the portal vein hypertension with Hepatomegaly and the size between more than 13mm and more than 13cm.

Constant injury to hepatocytes causes starts up the stellate cells which have a part in the start of transforming growth factor-beta. Normally liver parenchyma is changed by collagen deposition in per sinusoidal space[3]. Fibrosis leads to squeezing of the adjacent portal vein which causes contract of the lumen. Moreover, the contract of lumen increases the blood pressure in the portal vein this condition is termed portal hypertension[4][6].

As the several arms of the portal vein are contracted by fibrosis of per sinusoidal space, this causes of backflow of blood into the main portal vein. Thus, the main portal vein dilates in a patient suffering from portal hypertension[5].

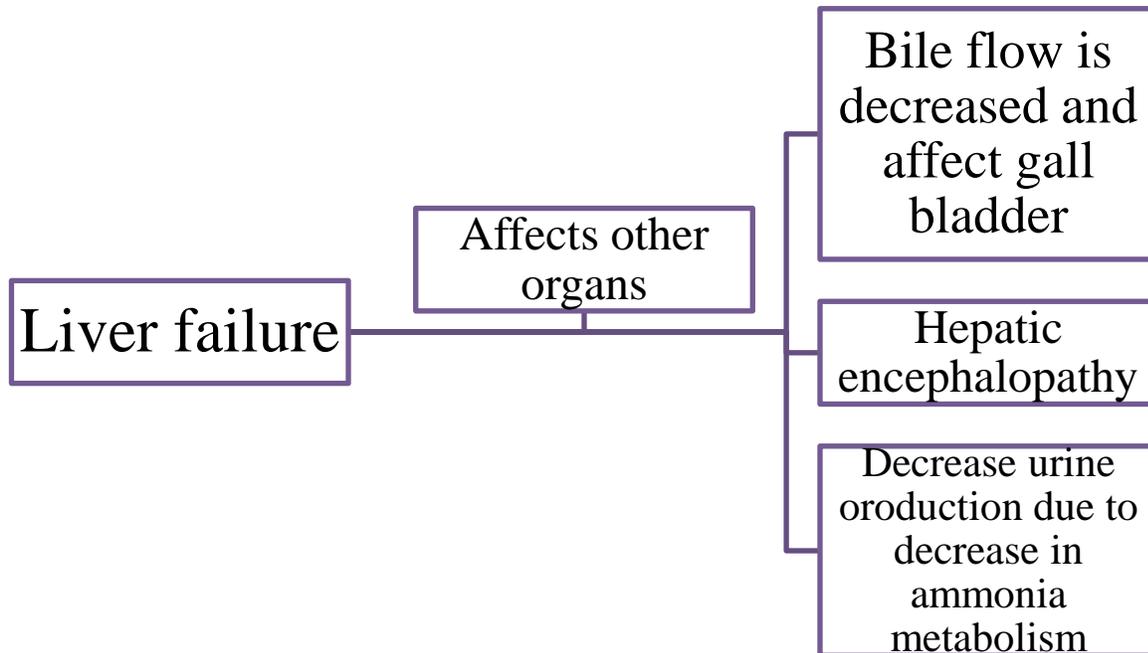
These circumstances lead to complications like fluid accumulation in the abdomen and enlargement of the spleen. Just as portal vein lumen contracts, cavity-causing ascites and also backflow into the spleen generate Hepatomegaly[6][8][9].

Splenic drainage decreases spleen starts load white blood cells, red blood cells platelets that will cause swelling and enlargement of the spleen. Splenic enlargement is caused by a decrease in blood flow through the splenic vein the decreased ability of the blood unloading from the spleen causes it to become packed and grow larger[7]. Hepatomegaly is not only caused by portal blockage but its main cause due to tissue hyperplasia and fibrosis the massive growth of spleen size is followed by an increase in splenic blood flow which participants in portal hypertension actively congesting the portal structure. Venous congestion within visceral organs due to portal hypertension contributes to starts via altered starling forces Diagnosis is mostly done by hepatic

venous pressure gradient measurement [7][8]. Portal hypertension leads to the shunting of portosystemic blood which is when blood turns away from the portal venous system and backs up into systemic veins. So first less blood gets to the liver, causing diminished liver function and reduces blood detoxification, which leads to an increase of toxic metabolites, like ammonia, in the blood. Ammonia and other poisons can pass through the blood-brain barrier, and cause hepatic encephalopathy. Second blood support in the systemic veins shows the way to portosystemic shunts, which cause in three points where the system and portal system are attached[6][8][10].

### **Sign and Symptoms:**

The first and the main sign of portal hypertension is gastrointestinal bleeding. In such a case, blood pops up in spontaneous rupture and bleeding from varices. Ascites is gathering of fluid in the abdomen that can cause abdominal cramps bloating and breathlessness Portal hypertension gastropathy is the most common complication caused by portal hypertension. This condition caused stomach problems and expands the blood vessels [9][10]. Hepatomegaly is one of the most common signs of portal hypertension. NAFLD found in 3 times with ascites and portosystemic encephalopathy present in 10% and 7% respectively. Because many tests can be regarded as the gold standard to diagnose portal hypertension, its diagnosis remains a big challenge. Even in renowned hepatology centers, patients with portal hypertension are regularly misdiagnosed as having liver cirrhosis [10] demonstrated that most of the hypertension patients undergoing liver transplantation carried a pretransplantation diagnosis of cirrhosis. The initial evaluation in patients with liver test disturbances or detected esophageal varices is commonly performed with abdominal ultrasonography. Nodularity of the liver side and thickening of the portal vein walls are sonographic features of portal hypertension [11] [15].



**Fig 1: Effect of liver failure on other organs**

**Causes of Portal hypertension:**

However, these demonstrations are not specific for portal hypertension can also be observed in patients with liver cirrhosis and port hypertension with transient elastography. Mean liver stiffness in a bigger cohort of hypertension patients [12]. As a result, the finding of liver rigidity values <14 kpa in the presence of clear signs of portal hypertension should raise the suspicion of Hepatomegaly in portal hypertension. Currently, liver biopsy remains essential in the diagnosis of Hepatomegaly in portal hypertension. It is indispensable for the rejection of liver cirrhosis, because based on radiological examinations; Hepatomegaly in portal hypertension patients is identical of cirrhotics [13]. If liver cirrhosis and additional liver diseases are known to cause

portal hypertension histologically have been kept out, the pathologist has to look very carefully for the discrete pathological characteristics of portal hypertension [14].

Based on the present guidelines all patients with cirrhosis should go through screening endoscopy looking for proof of esophageal varices. In patients with portal hypertension, it remains dim whether waiting for the development of cirrhosis before screening for esophageal varices is appropriate, or if screening endoscopy should be performed also in advance stages of diseases before cirrhosis development. In addition, it remains dim whether noninvasive variables can truly forecast the presence of esophageal varices or other signs of portal hypertension [15]. To deal with this issue we performed this study aimed at determining the prevalence of hypertension with well characterize and non-invasive predictors of portal hypertension and esophageal varies in these patients[16].The main target of this study is to have a more precise glance at the emerging increase in the Hepatomegaly by the portal vein hypertension and that is increasing the number of patients due to the liver disorder and further this liver disorder is moving towards the acute or chronic liver failure and also the renal failure or the diseases related to the kidney are also linkto this failure of the hepatic function.

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graph TD; A[Increase in portal hypertension due to intrinsic or idiopathic in nature] --> B[Affect the parenchyma of liver and also increased supply leads to increase in size of liver]; B --> C[Acute or chronic liver failure occurs];
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Increase in portal hypertension due to intrinsic or idiopathic in nature

Affect the parenchyma of liver and also increased supply leads to increase in size of liver

Acute or chronic liver failure occurs

**Fig2: Process of liver failure**

**Diagnosis:**

The diagnosis of the portal hypertension induced hepatomegaly and other liver related effects can be diagnosed properly by the Ultrasounds, CT- Scan these can tell about the increased size of the liver and also the give the visual appearance of this effect. Other diagnostic measures include as that those blood test that measure the enzymes level and also functioning of liver. The other possible diagnostic way is to detect it by biopsy of the affected part to check the extent of disease [17] [19]. At advance stage there is another option of biopsy which is done to evaluate the extent of damage occur to the organ to make the diagnosis and then move towards surgery or therapeutic drugs can be given.

**Epidemiology:**

Hypertension in the major vein of liver e.g.; portal vein and as that this hypertension as increased in pressure affect the other organs from where it pass through and mainly affected organs are liver and spleen etc. so the morbidity and mortality is also linked with this hypertension and as that those increasing the cost of treatment which is due to the surgery or drugs [18] [19]. The prevalence rate of portal hypertension induced liver diseases and liver failure is increasing day by day. Since 2010 this prevalence was about 5-7 percent but now due to the increase extent of causative agents this rate has been increased to about 15percent[20]. The mortality rate is about 1 to 2 percent. And as that the morbidity is also affecting the other organs along with liver and the organ most commonly affected with liver is kidney and CKD (chronic kidney disease) is the most apparent symptom in these patients. No sprint fondness is documented for the extent of splenomegaly by portal hypertension. Though, an annotation that black people might guarantee hemoglobin SC syndrome, an ailment associated with the sickle cell malady [21]. Contrasting the sickle cell ailment, which upshots in the trivial, auto infarcted type of spleen, patients by way of Hb SC syndrome might have the splenomegaly that escorts their tincture gall stones. Liver is the main organ and when it is affected it will also affect many processes in body as that urea production is affected and urine formation will also be affected and as that those liver metabolism factors will also be affected [22][30].

**Treatment options:**

It is important to check the treatment options for the portal hypertension induced liver failure and as that if it is acute in nature then treatment would be done by the medications and as that with continuous monitoring of liver function and as that to check any side effect of drug. It will also be important to monitor other organs to check their functions because it can also affect other organs[23]. If it is chronic in nature then treatment options left as to remove the most affected part of liver and as that those by doing biopsy check the spread of the disease. And treatment with drugs can also be used to reduce the spread of disease [24][29] . And also as that those liver transplant surgery may be done to improve the quality of life. This option is quite expensive and there might be transplant rejection in the patient which leads the patient to more worse condition as that during transplant immunosuppressant's are given which reduce the immunity [25] of patient and prone him/her towards more devastating infections as either bacterial, viral or fungal which affect the quality of life of patient so care must be done to avoid treatment related effects to the patient[26][27][28].

**Conclusion:**

Portal vein is the most important part of liver and carrying about 75 percent supply of liver. So any change in its pressure will affect the liver leading to as affecting its parenchyma and as that also cause acute or chronic liver failure. And this will leads to affect the quality of life of patient. And for this reason multi-organ failure may be done and this would increase the extent of morbidity as well as mortality. The focus must be on every aspect while diagnosis or prognosis is made to evaluate all the factors affecting it. To prevent the complications related to the disease.

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**Conflict of interest:**

There is no conflict of interest.

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