

Original Research

Evaluation of ultrasonographic findings in patients with portal hypertension: An observational study

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ABSTRACT:

Background: Portal hypertension is classified as prehepatic (portal or splenic vein thrombosis); intrahepatic (cirrhosis), and posthepatic (Budd-Chiari syndrome). The most common cause of portal hypertension is cirrhosis. In cirrhosis, the increased resistance is mostly caused by hepatic architectural distortion (fibrosis and regenerative nodules) but about a third of the increased resistance is caused by intrahepatic vasoconstriction, amenable to vasodilators. Hence; the present study was undertaken for assessing the ultrasonographic findings in patients with portal hypertension. **Materials & methods:** A total of 30 patients with portal hypertension were enrolled. A Performa was made and complete demographic and clinical details of all the patients were recorded. Ultrasound was done in all the patients under the hands of skilled and experienced radiologists. All patients were subjected to routine haematological testing. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Chi- square test was used for assessment of level of significance. **Results:** Portal vein diameter was found to be more than 13 mm in 56.67 percent of the patients while it was less than 13 mm in 43.33 percent of the patients. In the present study, splenic vein diameter was more than 7 mm in 73.33 percent of the patients while it was less than 7 mm in 26.67 percent of the patients. Ascites was found to be present in 83.33 percent of the patients while it was found to be absent in 16.67 percent of the patients. While assessing the ultrasonographic findings among patients divided on the basis of gender, non-significant results were obtained. **Conclusion:** Ultrasound is an effective diagnostic technique in portal hypertension patients for assessing the severity of the disease. However; further studies are recommended.

Key words: Portal hypertension, Ultrasound.

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INTRODUCTION

The portal vein is formed by the union of the superior mesenteric vein and the splenic vein. The mesenteric vein collects blood from the splanchnic circulation. Thus, portal venous inflow is determined by the state of constriction or dilatation of splanchnic arterioles. The initial mechanism in the genesis of portal hypertension is an increase in vascular resistance that can occur at any level within the portal venous system. Portal hypertension is therefore classified as prehepatic (portal or splenic vein thrombosis); intrahepatic (cirrhosis), and post-hepatic (Budd-Chiari syndrome).¹⁻³ The most common cause of portal hypertension is cirrhosis. In cirrhosis, the increased resistance is mostly caused by hepatic architectural distortion (fibrosis and regenerative nodules) but

about a third of the increased resistance is caused by intrahepatic vasoconstriction, amenable to vasodilators. This is caused by the activation of stellate cells with active contraction of myofibroblasts and vascular smooth muscle cells in portal venules, which in turn is caused by increased endogenous vasoconstrictors, such as endothelin, and reduced nitric oxide bioavailability.⁴⁻⁶ Hence; the present study was undertaken for assessing the ultrasonographic findings in patients with portal hypertension.

MATERIALS & METHODS

The present study was conducted with the aim of assessing the ultrasonographic findings in patients with portal hypertension. Ethical approval was

obtained from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 30 patients with portal hypertension were enrolled. Exclusion criteria for the present study included:

- Patients with decompensated liver diseases,
- HIV positive patients,
- Patients with presence of hepatocellular carcinoma,
- Patients with presence of metastasis in liver

A Performa was made and complete demographic and clinical details of all the patients were recorded. Ultrasound was done in all the patients under the hands of skilled and experienced radiologists. All patients were subjected to routine haematological testing. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Chi-square test was used for assessment of level of significance.

In the current research, assessment of a total of 30 patients with portal hypertension was done. 50 percent of the patients with portal hypertension belonged to the age group of more than 50 years. 33.33 percent of the patients and 16.67 percent of the patients with portal hypertension belonged to the age group of 30 to 50 years and less than 30 years respectively. 66.67 percent of the patients with portal hypertension were males while the remaining 33.33 percent of the patients were females. Portal vein diameter was found to be more than 13 mm in 56.67 percent of the patients while it was less than 13 mm in 43.33 percent of the patients. In the present study, splenic vein diameter was more than 7 mm in 73.33 percent of the patients while it was less than 7 mm in 26.67 percent of the patients. Ascites was found to be present in 83.33 percent of the patients while it was found to be absent in 16.67 percent of the patients. While assessing the ultrasonographic findings among patients divided on the basis of gender, non-significant results were obtained.

RESULTS

Graph 1: Age and gender-wise distribution

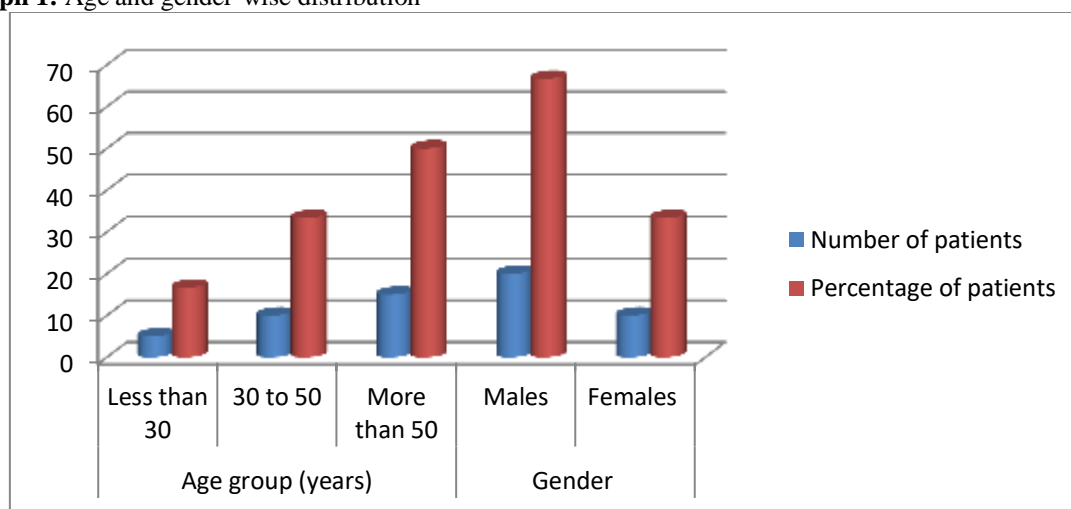
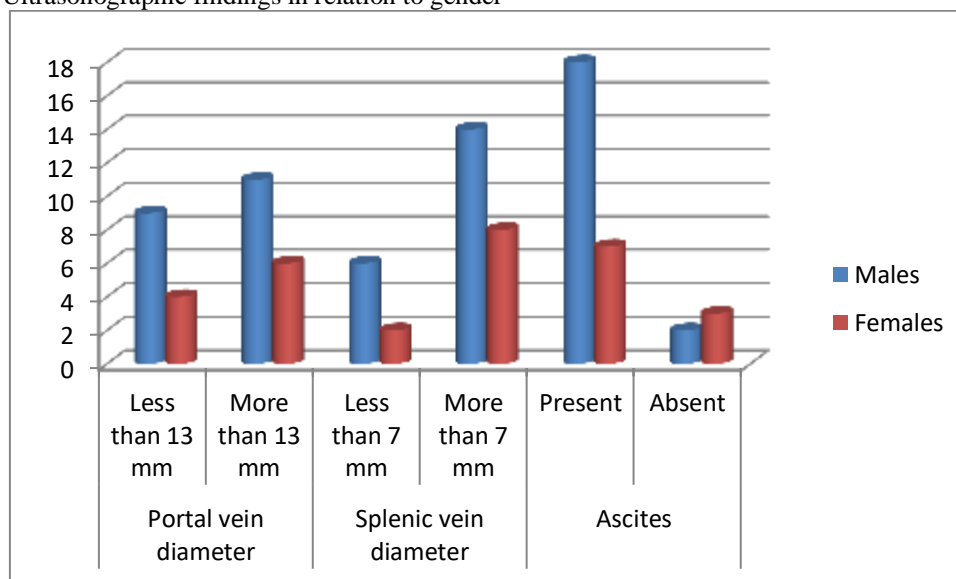


Table 1: Ultrasonographic findings

Ultrasound findings		Number of patients	Percentage of patients
Portal vein diameter	Less than 13 mm	13	43.33
	More than 13 mm	17	56.67
Splenic vein diameter	Less than 7 mm	8	26.67
	More than 7 mm	22	73.33
Ascites	Present	25	83.33
	Absent	5	16.67

Table 2: Ultrasonographic findings in relation to gender

Ultrasound findings		Males	Females	p- value
Portal vein diameter	Less than 13 mm	9	4	0.13
	More than 13 mm	11	6	
Splenic vein diameter	Less than 7 mm	6	2	0.32
	More than 7 mm	14	8	
Ascites	Present	18	7	0.82
	Absent	2	3	

Graph 2: Ultrasonographic findings in relation to gender

DISCUSSION

Portal hypertension is a detrimental complication resulting from obstruction of portal blood flow, such as cirrhosis or portal vein thrombosis. In liver cirrhosis, increased intrahepatic vascular resistance to the portal flow elevates portal pressure and leads to portal hypertension. Once portal hypertension develops, it influences extrahepatic vascular beds in the splanchnic and systemic circulations, causing collateral vessel formation and arterial vasodilation. This helps to increase the blood flow into the portal vein, which exacerbates portal hypertension and eventually brings the hyperdynamic circulatory syndrome.^{7,8}

The presence of portal hypertension may be clinically silent; however, findings such as splenomegaly, ascites and abdominal wall collaterals (caput medusae) strongly suggest its presence. Radiological imaging, such as Doppler ultrasound and computed tomography may demonstrate the presence of collateral vessels, alterations in portal venous flow, splenomegaly and ascites, thereby supporting the diagnosis of portal hypertension. Despite this, the first presentation of portal hypertension may be with variceal haemorrhage, and this needs to be urgently excluded in any patient with suspected liver disease who has significant gastrointestinal haemorrhage.^{9,10} Hence; the present study was undertaken for assessing the ultrasonographic findings in patients with portal hypertension.

In the current research, assessment of a total of 30 patients with portal hypertension was done. 50 percent of the patients with portal hypertension belonged to the age group of more than 50 years. 33.33 percent of the patients and 16.67 percent of the patients with portal hypertension belonged to the age group of 30 to 50 years and less than 30 years respectively. 66.67 percent of the patients with portal hypertension were males while the remaining 33.33 percent of the

patients were females. Portal vein diameter was found to be more than 13 mm in 56.67 percent of the patients while it was less than 13 mm in 43.33 percent of the patients. Kaji BC et al studied the predictive power of noninvasive investigative parameters (clinical, biochemical, radiological) for detection of esophageal varices in patients with portal hypertension (PHT) as compared to invasive parameters (upper gastrointestinal endoscopy). Fifty patients with PHT were studied. Detailed clinical history was taken and physical examination was done. All patients underwent the required hematological, biochemical, radiological, endoscopic and histopathological investigations. Platelet count/splenic size showed a significant correlation between presence or absence and grade of esophageal varices ($p < 0.00015$). If a cut-off value of 1,000/cu mm is taken, then 87.5% (35/40) patients with esophageal varices have ratio $< 1,000$ while 20% (2/10) of patients with ratio $< 1,000$ did not have any varices. It was also observed that lower the ratio, higher the grade of varices. Asymptomatic esophageal varices, which is quite common, can be easily diagnosed with invasive endoscopy or otherwise can be suspected with noninvasive predictors like platelet/spleen size ratio in our country, where financial constraint is a major problem for investigations like endoscopy.¹¹

In the present study, splenic vein diameter was more than 7 mm in 73.33 percent of the patients while it was less than 7 mm in 26.67 percent of the patients. Ascites was found to be present in 83.33 percent of the patients while it was found to be absent in 16.67 percent of the patients. While assessing the ultrasonographic findings among patients divided on the basis of gender, non-significant results were obtained. With its simplicity and safety, contrast-enhanced US has become popular for assessing liver disease. Currently, it is applied in the wide range of liver diseases to differentiate diffuse liver diseases and

assess the severity of portal hypertension, in addition to the management of focal hepatic lesions. The interval time between vessels is a representative parameter for microbubble hemodynamics and shows close correlation with portal pressure, between free portal pressure and hepatic vein–hepatic artery interval time ($r=-0.804$, $p=0.009$) or the portal vein–hepatic artery interval time ($r=0.506$, $p=0.036$). More recent studies have demonstrated original parameters for portal pressure; the first study proposed “regional hepatic perfusion” using SonoVue, which correlated with HVPG ($r=0.279$, $p=0.041$) and hyperdynamic syndrome markers. The other study has shown that the portal vein/hepatic artery time-intensity curve ratio, portal vein/hepatic artery strength ratio, and portal vein/hepatic artery wash-in perfusion slope ratio have close correlation with portal pressure.¹²⁻¹⁴ Sharma MP et al evaluate the value of real time ultrasound in establishing the diagnosis and the etiology of portal hypertension. Patients attending the outpatient department of a tertiary care centre were included. There were 324 consecutive patients with portal hypertension due to cirrhosis ($n = 229$), non cirrhotic portal fibrosis (NCPF: $n = 64$) and extrahepatic portal venous obstruction (EHPVO: $n = 31$). During this period, 146 patients with dyspepsia, 35 with splenomegaly and 32 with ascites due to varied causes served as negative and positive controls. Real time ultrasonography using a 3.5 MHz linear array scanner was performed in a fasting state in all subjects. Portal and splenic vein diameter greater than 10 mm, splenomegaly, hepatic and splenic hilar collaterals were suggestive of portal hypertension. Non visualization of the portal vein which was replaced by a cavernoma had a diagnostic accuracy of 98% in EHPVO. Splenic infarcts and absence of ascites were features of non cirrhotic portal hypertension (NCPF and EHPVO). Sonography had an overall diagnostic accuracy of 80%. A stepwise logistic regression with multivariate analysis using discriminate function showed that collaterals at the hepatic and splenic hilum, hepatomegaly, ascites and splenic infarcts were independent markers to differentiate cirrhotic from noncirrhotic causes of portal hypertension. The discriminate equation generated had a mismatch of 9.8%. Correlations between the sonographic signs demonstrated that the variceal grade correlated positively with the presence of splenic hilar collaterals and the liver size inversely correlated with presence of ascites. It was concluded that real time ultrasonography is an accurate method to establish the presence and etiology of portal hypertension.¹⁵

CONCLUSION

From the above results, the authors conclude that ultrasound is an effective diagnostic technique in portal hypertension patients for assessing the severity of the disease. However; further studies are recommended.

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