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"Etiology of Portal Hypertension in Children at the Department of Pediatric Gastroenterology & Nutrition, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh"

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Abstract **Original Research Article**

Background: Portal hypertension is an important cause of morbidity and mortality in Bangladeshi children. Development of esophageal varices and bleeding is one of the major complications of CLD. The mortality from each episode of variceal bleeding is 30-50% depending on the clinical status of the patient. All conditions that interfere with blood flow at any level within the portal system can lead to portal hypertension. For better management of this disorder, it is important to determine the underlying cause. ***Objective:*** To assess the Etiology of Portal Hypertension in Children. ***Methods:*** This cross-sectional descriptive study was conducted at the Emergency, Observation and Referral Unit, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh during the period Jan 2018 to July 2019. 47 patients who were diagnosed as portal hypertension were determined by liver biopsy, abdominal sonography, abdominal computed tomography scan, and liver doppler sonography. Demographic data and other related information regarding etiology and complications were recorded in a standard datasheet. ***Results*:** Total 47 cases were included in this study. Their age range was 1.5-16 years. It was observed that 20 (42.6%) patients belonged to age group 6-10 years. The mean age was 9.22±9.85 years with ranged from 2.5 to 16 years. It was observed that almost two third (67.7%) patients were male and 18 (38.3%) were female. Among 47 patients 27 were diagnosed as extrahepatic portal hypertension and 20 were diagnosed as CLD with portal HTN. Shows the etiology of portal hypertension of studied patients. Extrahepatic portal hypertension was the most common etiology (57.4%). Among CLD patients Wilson disease was the most common (12; 25.5%). Two (4.3%) patients were cryptogenic CLD and two (4.3%) were Budd Chiari Syndrome. One patient was Biliary cirrhosis and one patient had Auto immune hepatitis. *Conclusion:* We concluded that intrahepatic diseases are the most common causes of portal hypertension in children in this center. Doppler USG can be used as a non-invasive test for diagnosis of portal hypertension in children. So Doppler USG can also be used for diagnosing portal hypertension but also for differentiating between CLD and extrahepatic portal hypertension.

Keywords: Portal hypertension; Children; Etiology; Extra-hepatic; Intrahepatic.

INTRODUCTION BSMMU

Portal hypertension is an important cause of morbidity and mortality in Bangladeshi children. Development of esophageal varices and bleeding is one of the major complications of CLD. The mortality from each episode of variceal bleeding is 30-50% depending on the clinical status of the patient. Portal hypertension is the hemodynamic abnormality frequently associated with serious liver disease, although it is recognized in a variety of extrahepatic diseases also. Portal hypertension can be sinusoidal, pre sinusoidal and post sinusoidal, therefore accurate diagnosis by imaging modality can help in prompt treatment [1]. It is estimated that approximately 50% of pediatric patients with chronic liver disease and 90% of those with extrahepatic portal vein obstruction (EHPVO) will

experience gastrointestinal bleeding [2]. Esophageal variceal bleeding is one of the most important complications of both cirrhotic and non-cirrhotic portal hypertension because of its high mortality [3]. Portal hypertension leading to oesophageal variceal bleeding is very common and one of the most dreaded complications of CLD because of its high mortality. Portal hypertension may manifest as gastrointestinal bleeding, splenomegaly and ascites [4]. When CLD is diagnosed for the first time, oesophageal varices are present in about 40% of patients with compensated disease and in about 60% patients with decompensated disease with ascites [5]. It has been estimated that up to 90% of patients with cirrhosis will ultimately develop oesophageal varices [6]. The incidence of oesophageal varices increases in approximately 5% per year in patients with CLD and the rate of progression from small to large varices are approximately 5 – 10% per year [7]. Clinically significant portal hypertension is diagnosed when clinical manifestations of the disease appear or the portal pressure gradient exceeds 10 mmHg [8]. It has been estimated that esophageal varices are present in 30%-40% of the compensated cases and 60% of the decompensated patients at the time of diagnosis [9, 10]. Portal hypertension (PHTN) and bleeding from oesophageal varices in children remain a difficult medical problem [4]. The gold standard for the diagnosis of portal hypertension is direct measurement of portal pressure or hepatic venous pressure gradient [11]. These measurements can be obtained only by invasive methods, which are not feasible in most centers of the world. In cirrhotic patients with no varices noted on endoscopy, the annual incidence of new varices is reported as 5%-10% according to published studies [12, 13]. A careful investigation of the cause of the portal hypertension is essential for choosing the best treatment. For patients with extra-hepatic portal vein thrombosis, supportive treatments should be performed prior to surgical treatment. In children, EHPVO can either be idiopathic or be the result of congenital abnormalities, prothrombotic states, autoimmune systemic disease, vasculitis, local inflammatory conditions, portal vein injury, or occur post–liver transplantation. In this point of view, this study is aimed to determine whether Doppler Ultrasonography is effective to determine presence and severity of portal hypertension.

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted at the Emergency, Observation and Referral Unit, Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh during the period Jan 2018 to July 2019. 47 patients who were diagnosed as portal hypertension were determined by liver biopsy, abdominal sonography, abdominal computed tomography scan, and liver Doppler sonography. Demographic data and other related information regarding etiology and complications were recorded in a standard datasheet. The patients below 18 years of age diagnosed as portal hypertension. Demographic data and other related information regarding etiology and complications were recorded in a standard datasheet. Written informed consent was taken from the parent. Endoscopy of upper GIT to detect oesophageal varices and other required investigations to detect etiology and complications were carried out as required after admission. Collected data were checked manually and analyzed by computer-based program SPSS for Windows (version 22.0).

Clinical manifestations of portal hypertension

History: The medical history should be directed towards determining the cause of portal hypertension and the presence of the complications of portal hypertension.

 Determination of the cause of portal hypertension involves the following:

- History of jaundice.
- History of blood transfusions, intravenous drug use (hepatits B and C).
- Family history of hereditary liver disease (Wilson disease).

 Determination of the complications of portal hypertension involves the following:

- Haematemesis or melaena (variceal bleeding).
- Increasing abdominal girth (ascites).
- Haematochezia (bleeding from portal colopathy).
- Mental status changes such as lethargy, increased irritability, an altered sleep patterns (portosystemic encephalopathy).
- Abdominal pain and fever (SBP).

Physical Examination

 Signs of portosystemic collateral formation include the following:

- Dilated veins in the anterior abdominal wall.
- Caput medusa (tortuous collaterals around the umbilicus).
- Rectal hemorrhoids.
- Ascites - shifting dullness and fluid thrill.
- Venous pattern on the flanks (portal-parietal peritoneal shunting).

Investigations for Portal hypertension:

a) Barium swallows X-ray of oesophagus- Warm like filling defect in the regular contour of oesophagus. Widening and gross dilatation are helpful signs.

b) Endoscopy of upper GIT: Oesophageal varices, gastric varices and gastropathy are seen.

c) Ultrasonography of hepatobiliary system:

- Dilated portal vein (>13mm): non-specific.
- Portal vein pulsativity.

- Ratio of portal vein diameter (in mm) to body surface area (meter square). If this ratio exceeds >12, oesophageal varices are likely.
- Ratio of lesser omentum thickness to aortic diameter at the level of superior mesenteric artery. A ratio >1.9 is a good predictor of varices.
- Biphasic or reverse flow in portal vein (late stage): pathognomic.
- Recanalisation of paraumbilical vein: pathognomic
- Portal-systemic collateral pathways (collateral vessels/varices).
- Splenomegaly.
- Ascites.
- Cause of portal hypertension often identified, most commonly liver cirrhosis, portal vein thrombosis.

d) Doppler ultrasonogram: It shows:

- Anatomical abnormalities.
- Patency.
- Hepatofugal flow.
- Portal vein flow velocity and
- Porto systemic shunt patency.

e) Liver biopsy: A histological diagnosis is

- Loss of hepatic architecture.
- Fibrous septa.
- Nodular degeneration.

f) CT & MRI:

- Dilated portal vein.
- Contrast enhancement of paraumbilical vein: pathognomic.
- Collateral vessels / varices.
- Splenomegaly.
- Ascites.
- Cause of portal hypertension often liver cirrhosis.

Doppler Ultrasonography of Hepatobiliary system

Doppler Ultrasonography was done by afiniti 70G apparatus equipped with 3.5 MHz transducer having both gray scale and Doppler facility. Using gray scale diameter of portal vein, thrombus in portal vein, liver size and echogenecity, cavernous transformation and splenic size were recorded. Doppler study detected portal vein flow velocity and direction of blood flow in portal vein. All Doppler studies were done by a single sonologist at Nuclear Medicine Department.

Data processing and analysis

All the data were entered into a personal computer and thoroughly checked for any possible errors and then processed and analyzed by Statistical Package for Social Science (SPSS 22.0 Chicago, Illinois, 2016)**.** Frequency was analyzed by mean, range, percentage for categorical variables: age, sex, clinical features, grading of oesophageal varices and doppler parameters. Chai Square test was applied to compare different variables of Doppler USG and grading of oesophageal varices with portal vein flow velocity.

RESULTS

Table-1: Distribution of the studied patients by age (n=47)

Age (in year)	Number of patients	Percent
≤5	10	21.3
6-10	20	42.6
>10	17	36.2
Mean±SD	9.22±3.85	
Range(min, max)	2.5-16	

A total of 47 cases were included in this study. Their age range was 1.5-16 years. It was observed that 20 (42.6%) patients belonged to age group 6-10 years. The mean age was 9.22±3.85 years with ranged from 2.5 to 16 years (table-1). It was observed that almost 29 (67.7%) patients were male and 18(38.3%) were female (fig-1).

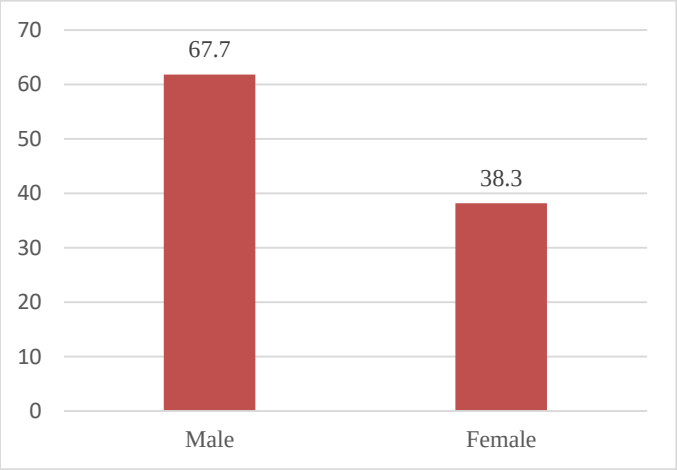

Fig-1: Pie chart showing sex of the study patients.

Table-2: Etiology of Portal Hypertension (n=47)

Etiology of portal HTN	No of patients	Percentage of patient
Extra hepatic portal HTN	27	57.4
Wilson disease	12	25.5
Budd chiari syndrome	2	4.3
Chronic Hep B	1	2.1
Biliary cirrhosis	1	2.1
Histoplasmosis	1	2.1
Cryptogenic	2	4.3
Autoimmune hepatitis	1	2.1

Among 47 patients 27 were diagnosed as extrahepatic portal hypertension and 20 were diagnosed as CLD with portal HTN. Table 1 shows the etiology of portal hypertension of studied patients. Extrahepatic portal hypertension was the most common etiology (57.4%). Among CLD patients Wilson disease was the most common (12; 25.5%). Two (4.3%) patients were cryptogenic CLD and two (4.3%) were Budd Chiari Syndrome. One patient was Biliary cirrhosis and one patient had Auto immune hepatitis (Table-2).

Table-3: Classification of portal hypertension in children [14]

Prehepatic	Intrahepatic	Post-hepatic
Splenic vein thrombosis	Autoimmune hepatitis	Budd-Chiari syndrome
Portal vein thrombosis	Hepatitis B and C	Congestive heart failure
Congenital stenosis of the portal vein	Alfa1 anti-trypsin deficiency	Inferior vena cava obstruction
Arteriovenous fistula	Wilson's disease	
Splenomegaly	Steatohepatitis	
	Glycogen storage disease type IV	
	Toxins	
	Biliary atresia	
	Primary sclerosing cholangitis	
	Cystic fibrosis	
	Congenital hepatic fibrosis	
	Caroll's disease	
	Choledochal cyst	
	Familial cholestasis	
	Veno-occlusive disease	
	Schistosomiasis	
	Gaucher's disease	
	Idiopathic portal hypertension	
	Peliosis hepatis	
	Primary biliary cirrhosis	

DISCUSSION

A total of 47 patients with portal hypertension were included in this study. Their ages were between 1.5 to 16 years. Most (42%) of the patients were in the age group between 6-10 years. The mean (±SD) age of the studied patients was found to be 9.2±3.85years, male was 61% and female 38%. Similar results were also observed in another study done in Bangladesh by Karim *et al*. [15]. In his study 31 (56%) were male and 24 (44%) female. In another study done in BSMMU patient's age group was found between 2 to 15 years and male female ratio was 4:1 [3]. Detail clinical history was taken and H/O hematemesis was found in 26 (55%) patients. Ten patients (21%) had parental consanguinity. In a study of Karim *et al*. [16] parental consanguinity was found in 24% cases of Wilson disease. Regarding CLD patients jaundice was present in 90%, hepatomegaly in 80%, ascites in 70% and stigmata of CLD was present in 55% cases. Splenomegaly was present in 92 % extrahepatic and 90% of CLD patients. In this study the most common etiology of portal hypertension was extrahepatic (57%). Arora et al. [17] observed that 76.5% cases of portal hypertension were extra-hepatic in North Indian children. Mahmud et al. [18] studied 40 children with portal hypertension and found 32 (80%) due to pre-hepatic causes and 08 (20%) due to hepatic causes. Podder et al. [19] studied portal hypertension in child and found extrahepatic portal hypertension in 54% cases. However, controversy exists regarding the suggested patterns of portal hypertension in children and adults. In another study done by Imanieh et al. [20] found 42 of 45 patients (93.3%) had portal hypertension due to intrahepatic cause. Extra-hepatic portal hypertension was detected only in 3 (6.7%) patients. Most common etiology of chronic liver disease was found to be Wilson disease (12; 60%). Karim et al. [15] found similar results in a study done at BSMMU. The predominant etiology of CLD was Wilson's disease (n=55, 65.5%). It was observed that the pattern of etiology is regionally variable. In our region extrahepatic is the most cammon cause of portal hypertension. Regarding etiology of CLD we found Wilson disease was the commonest cause. But as our institution is the tertiary care centre it may not reflect the scenario of whole country. In another study, extra-hepatic portal venous obstruction was also the major cause of portal hypertension in children [21]. Grimaldi et al. have reported that the main causes of portal hypertension in children are cirrhosis and congenital hepatic fibrosis [22]. Bernard et al. have also reported that cirrhosis was responsible for 51% of portal hypertension cases and extra-hepatic portal venous obstruction was found in 34% of cases [23]. However, controversy exists regarding the suggested patterns of portal hypertension in children and adults, and it appears that this pattern is regionally variable. In some studies performed in the West, intrahepatic portal hypertension was more frequent in children [24, 25] whereas studies performed in India observed that extra-hepatic portal hypertension was more frequent in children [26]. In extra-hepatic portal hypertension patients tolerate variceal bleeding relatively well because of an intact liver function and coagulation system [27, 28]. Unlike children with intrahepatic portal hypertension, those diagnosed with extra-hepatic portal hypertension seem healthy prior to the sudden onset of symptoms [29].

CONCLUSION

We concluded that intrahepatic diseases are the most common causes of portal hypertension in children in this center. Doppler USG can be used as a non-invasive test for diagnosis of portal hypertension in children. So Doppler USG can also be used for diagnosing portal hypertension but also for differentiating between CLD and extrahepatic portal hypertension.

REFERENCE

1. Keerthi, K., Kumar, H. S., Kalra, V. B., Kusumalatha, P., & Sunil, A. (2015). Doppler–a very helpful diagnostic tool for evaluating portal hypertension. J Evid Based Med Health, 2, 2220-24.
2. Adami, M. R., Ferreira, C. T., Kieling, C. O., Hirakata, V., & Vieira, S. M. G. (2013). Noninvasive methods for prediction of esophageal varices in pediatric patients with portal hypertension. World Journal of Gastroenterology: WJG, 19(13), 2053.
3. Hussain, F., Karim, A. B., Matin, A., Sultana, K., & Anwar, S. A. (2016). Portal Hypertension: 2 years' Experience in Department of Pediatric Gastroenterology and Nutrition, at a Tertiary Care Hospital, Bangladesh. Journal of Shaheed Suhrawardy Medical College, 8(1), 26-29.
4. Carale, J. (2017). 'Portal Hypertension', e-medicine available at http/www.emedicine .com/med/ topic/182098. Http accessed on 8/1/2018.
5. Sharma, S. K., & Aggarwal, R. (2007). Prediction of large esophageal varices in patients with cirrhosis of the liver using clinical, laboratory and imaging parameters. Journal of gastroenterology and hepatology, 22(11), 1909-1915.
6. Rigo, G. P., Merighi, A., Chahin, N. J., Mastronardi, M., Codeluppi, P. L., Ferrari, A., ... & Manenti, F. (1992). A prospective study of the ability of three endoscopic classifications to predict hemorrhage from esophageal varices. Gastrointestinal endoscopy, 38(4), 425-429.

7. D'Amico, G., & Morabito, A. (2004). Noninvasive markers of esophageal varices: another round, not the last. Hepatology, 39(1), 30-34.
8. Groszmann, R. J., Garcia-Tsao, G., Bosch, J., Grace, N. D., Burroughs, A. K., Planas, R., ... & Makuch, R. (2005). Beta-blockers to prevent gastroesophageal varices in patients with cirrhosis. New England Journal of Medicine, 353(21), 2254-2261.
9. D'amico, G. (1995). PAGLIARO) L., BOSCH J.– The Treatment of Portal Hypertension–A Meta-Analytic Review. Hepatology, 22(1), 332-354.
10. D'Amico, G., Luca, A. (1997). Natural history. Clinical-haemodynamic correlations. Prediction of the risk of bleeding. Baillieres Clin Gastroenterol, 11; 243-56.
11. Achinge, I. G., Malu, A. O., Okeke, E. N., Agaba, E. I., & Misauno, M. A. (2011). Prevalence of oesophageal varices in newly diagnosed chronic liver disease patients at The Jos University Teaching Hospital, Jos.
12. Merkel, C., Marin, R., Angeli, P., Zanella, P., Felder, M., Bernardinello, E., ... & Portale, G. T. P. L. I. (2004). A placebo-controlled clinical trial of nadolol in the prophylaxis of growth of small esophageal varices in cirrhosis. Gastroenterology, 127(2), 476-484.
13. Merli, M., Nicolini, G., Angeloni, S., Rinaldi, V., De Santis, A., Merkel, C., ... & Riggio, O. (2003). Incidence and natural history of small esophageal varices in cirrhotic patients. Journal of hepatology, 38(3), 266-272.
14. Bargalló, X., Gilabert, R., Nicolau, C., García-Pagán, J. C., Bosch, J., & Brú, C. (2003). Sonography of the caudate vein: value in diagnosing Budd-Chiari syndrome. American Journal of Roentgenology, 181(6), 1641-1645.
15. Sobhan, P. K., Sarojam, B., Krishnan, R., Kumar, A. S., & Devadas, K. (2017). Clinical Profile of Chronic Liver Disease in Children: Experience from a Tertiary Care Teaching Hospital in South India. Journal of Clinical and Experimental Hepatology, 7, S98.
16. Karim, M. B., Rahman, M. M., & Islam, M. S. (2007). Wilson's disease with hepatic presentation in childhood. Mymensingh medical journal: MMJ, 16(1), 29-32.
17. Arora, N. K., Lodha, R., Gulati, S., Gupta, A. K., Mathur, P., Joshi, M. S. & Mitra, D. K. (1998). Portai hypertension in North Indian children. The Indian Journal of Pediatrics, 65(4), 585-591.
18. Mahmud, S., Ahmed, S. S., Gulshan, J., & Tasneem, F. (2015). Etiology of Portal Hypertension in Children-An Experience in a Tertiary Centre of Bangladesh. Bangladesh Journal of Child Health, 39(1), 14-17.
19. Poddar, U., Thapa, B. R., Rao, K. N., & Singh, K. (2008). Etiological spectrum of esophageal varices due to portal hypertension in Indian children: is it different from the West. Journal of gastroenterology and hepatology, 23(9), 1354-1357.
20. Imanieh, M. H., Dehghani, S. M., Khoshkhui, M., & Malekpour, A. (2012). Etiology of portal hypertension in children: a single center's experiences. Middle East journal of digestive diseases, 4(4), 206.
21. Adami, M. R., Ferreira, C. T., Kieling, C. O., Hirakata, V., & Vieira, S. M. G. (2013). Noninvasive methods for prediction of esophageal varices in pediatric patients with portal hypertension. World Journal of Gastroenterology: WJG, 19(13), 2053.
22. Poddar, U., Thapa, B. R., Rao, K. N., & Singh, K. (2008). Etiological spectrum of esophageal varices due to portal hypertension in Indian children: is it different from the West. Journal of gastroenterology and hepatology, 23(9), 1354-1357.
23. Grimaldi, C., de Goyet, J. D. V., & Nobili, V. (2012). Portal hypertension in children. Clinics and research in hepatology and gastroenterology, 36(3), 260-261.
24. Bernard, O., Alvarez, F., Brunelle, F., Hadchouel, P., & Alagille, D. (1985). Portal hypertension in children. Clinics in gastroenterology, 14(1), 33-55.
25. Maksoud, J. G., Gonçalves, M. E. P., Porta, G., Miura, I., & Velhote, M. C. P. (1991). The endoscopic and surgical management of portal hypertension in children: analysis of 123 cases. Journal of pediatric surgery, 26(2), 178-181.
26. Gonçalves, M. E. P., Cardoso, S. R., & Maksoud, J. G. (2000). Prophylactic sclerotherapy in children with esophageal varices: long-term results of a controlled prospective randomized trial. Journal of pediatric surgery, 35(3), 401-405.
27. Yachha, S. K. (2002). Portal hypertension in children: An Indian perspective. Journal of gastroenterology and hepatology, 17, S228-S231.
28. Bosch, J., Berzigotti, A., Garcia-Pagan, J. C., & Abraldes, J. G. (2008). The management of portal hypertension: rational basis, available treatments and future options. Journal of hepatology, 48, S68-S92.
29. Grauer, S. E., & Schwartz, S. I. (1979). Extrahepatic portal hypertension: a retrospective analysis. Annals of surgery, 189(5), 566.