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Sonographic Measurements of Portal Vein Diameter of Healthy Adult in Sylhet, North East Part Bangladesh.

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Abstract

Introduction with Objective: *Portal vein diameter is important in portal hypertension. So this study was designed to see portal vein diameter among healthy adult.* ***Materials and Methods:*** *Consecutive healthy (nondiabetic, normotensive without clinical, biochemical and sonological evidence of liver disease) were enrolled. Portal vein diameter in resting, inspiratory and expiratory phases were recorded. Average of data of resting, inspiratory and expiratory diameters were calculated. And average of all three diameters of each person were taken as mean portal vein diameter. Relation of portal vein diameters with age, sex, BMI and abdominal circumference were calculated using SPSS version 20.* ***Result:*** *Total 237 (male 135; 57.0% and female 102; 43.0%, age ranging from 18 years to 93 years, mean 38.19) were enrolled. The mean portal vein diameter was 8.81 mm ranging from 6.1 mm to 13 mm for both sexes. Portal vein diameter was significantly higher among males (mean 9.06 mm vs 8.47mm; P=0.003). Within females portal vein diameter varied significantly with BMI.* ***Conclusion:*** *The mean portal vein diameter in our study was 8.81 mm (ranging from 5 mm to 13 mm. So higher diameter may give suspicion for raied portal vein pressure.*

Key words: *Portal vein diameter, normal healthy adult, portal hypertension.*

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Introduction:

Cirrhosis of liver, the end stage of chronic liver disease, which is characterized by generalised parenchymal necrosis, fibrosis and regenerative nodule formation with loss of normal architecture. Portal hypertension is the major cause of severe complications and death in patients with cirrhosis[1]. Due to portal hypertension dilatation of portal vein, splenomegaly and porto-systemic collaterals formations at different sites are observed. Direct measurement of portal venous pressure is invasive and complicated. The indirect method of portal pressure determination i.e diameter of portal vein measurement is thus one of the preferred methods[2,3]. In healthy people the diameter varies according to gender , age, height, weight and BMI. There is a correlation between portal vein diameter and various physical parameters like age, ex and height[4]. Physical factors like respiration, postural change, absorptive status also affects the caliber[5]. Normal portal vein diameter (PVD) can vary between 7 to 15 mm[6,7,8]. Diameter greater than 13 mm is assumed to be the cutoff point for portal hypertension (5). Some studies set the upper limit of normality of portal vein diameter is 14.5mm[9]. But no such report regarding portal vein diameter in healthy person in Bangladesh is available. Hence, the study aimed to estimate the mean portal vein diameter and evaluate its relationship with age, gender, and body mass index (BMI) in apparently healthy people without evidence of liver disease in Sylhet, Bangladesh.

Materials and Methods:

Consecutive apparently healthy volunteer age 18 years or above were included in this study following inclusion criteria: Normotensive, Nondiabetic, Having no clinical, Biochemical or sonological evidence

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of liver disease, No suffering from chronic debilitating disease, No past history of surgery, Not suffering from cardiac disease, Non-pregnant and Gave consent to take part in the study. Information of personal profile, height, weight, abdominal circumference, clinical information, recent biochemical reports were recorded in predesigned data sheet. Abdominal circumference was measured by using a measuring tape at the level of the umbilicus. Examination was done keeping the volunteer fasting at least for 6 hours. Portal vein diameter during inspiration, expiration and resting phase were measured. The examination was performed in B mode using a GE machine (Model E 10) equipped with high (5-10 MHz) and low frequency (2.5 -5 MHz) probe. Diameter of the portal vein was measured in its extrahepatic portion at the hilum of the liver just before the bifurcation into the right and left divisions lying supine and the right anterior oblique position. Measurement was taken three times for each phase and average value was taken. Then averae of poral vein diameter of the three phases were calculated for each persons and was taken as mean portal vein diameter. The examination was performed same experienced radiologist to avoid inter-observer variation. This cross-sectional study was conducted in a medical imaging department of a tertiary diagnostic care centre in Sylhet, in the North East region of Bangladesh. Data were collected from December 2023 to May 2024. Statistical analysis was done using Statistical Package for Social Science (SPSS Version 20). For linear data, mean, median and SD were calculated. For categorical data percentage were calculated. Chi-square test was done to compare the variables and P value < 0.05 was taken as significant.

Results:

Total 237 participants, apparently healthy, non-diabetic, normotensive having no clinical, biochemical and sonological evidence of liver disease, were included in this study. Age of them varied from 18 years to 93 years (mean 38.19411 and SD 15.0021). Of them 135 (57.0%) and 102 (43.0%) were male and female respectively (Table I). Anthropometric data with mean portal vein diameter were given in table II. Portal vein diameter (mean) varied from 6.10 mm to 13.0 mm (mean 8.8129 and SD 1.16726) with median value 8.70 and mode 9.00. Between sexes portal vein diameter was significantly higher among males (p=0.003). But PV diameter showed no significant difference within age groups or abdominal circumference in both sexes (Table no. III). But among females, PV diameter significantly varied with BMI (p=0.031).

Table no. I:

Total number of participant		237	
Age range		18 to 93	
Mean		mean 38.1941	SD 15.0021
Male		135	57 %
Female		102	43 %
Marital status			
	single	64	27%
	Married	170	71.7%
	Others	03	1.2%

Table no. II:

	minimum cm	**maximum cm**	**mean and SD**
Height	136	180	158.2658 ±9.72901
BMI	14.8	34.58	22.65 ± 3.88536
Abdominal circumference	49	112	81.059 ± 11.456682
Portal vein Diameter (inspiration)	0.6	1.4	9.051 ±.197
Portal vein diameter (Resting)	0.5	1.3	8.84 ± 0.149
Portal vein diameter (Expiration)	0.6	1.2	8.57±0.1574
Portal vein diameter (mean)	6.1	1.3	0.88129 ±0.116727
PVD (male)	5.0	1.3	0.90679 ± 0.119983
PVD (Female)	0.61	1.13	0.84754 ±0.1031

Table no. III:

		Portal vein size		
		up to 10 mm (212)	>10 mm (25)	P value
Age group	Up to 25 years	54 (25.47)	1 4.0	
	26 – 45 years	100 47.16	17 68.0	0.093
	46 – 60 years	41 19339	5 20.0	
	>60 years	17 8.018	2 8.0	
Sex	Male	114 53.77	21 84.0	0.003*
	Female	98 46.226	4 16	
BMI	Under weight	27 12.735	3 12	
	Normal weight	89 41.98	10 40	0.385
	Overweight	45 21.226	6 24	
	Obesity I	43 20.28	3 12	
	Obesity II	8 3.77	3 12	
For male	Up to 25 years	32 15.09	1 4.0	0.149
	26 – 45 years	57 26.88	14 56	
	46 – 60 years	15 7.07	4 16	
	>60 years	10 4.71	2 8	
	BMI			
	Under weight	17 8.018	2 8	
	Normal weight	44 20.75	9 36	
	Overweight	31 14.62	6 24	0.656
	Obesity I	21 9.90	3 12	
	Obesity II	1 .047	1 4	
	Abd. circumference			
	up to 94 cm	103 48.58	18 72	0.375
	>94 cm	11 5.188	3 12	
For female	Age groups			
	Up to 25 years	22 10.377	0	0.570
	26 – 45 years	43 20.28	3 12	
	46 – 60 years	26 12.26	1 4	
	>60 years	7 3.30	0	
	BMI			
	Under weight	10 4.716	1 4	
	Normal weight	45 21.226	1 4	
	Overweight	14 6.037	0	0.031*
	Obesity I	22 10.377	0	
	Obesity II	7 3.30	2 8	
	Abd. circumference			
	up to 80 cm	48 22.54	2 8	0.676
	>80 cm	50 23.58	2 8	

Discussion:

In this study mean PVD diameter was 8.81 mm which was similar to report from North East Part of India[10] and one Iranian report of cadeveric portal vein diameter at autopsy[11]. But this is lower than that from Kolkata India[7], USA[12], Nigeria[13], and Nepal[14] and higher than that of report from Addis Ababa, Ethiopia[15]. This variations may be due difference in study population, study design, used technique of PVD measurement and co-operation of participants. In our series PVD was highest among 26 to 45 years age group and difference was not statistically significant. Increase of PVD

with increase of age was found in reports from Kolkata[7] and Karnataka[4] from India, USA[12], Nigeria[13], Addis Ababa, Ethiopia[15]. In our study PVD significantly varied between sexes which contradicts the report from Kolkata, India and Addis Ababa, Ethiopia. This may also be due to differences in participant and sampling method and sample size. Within female participants, PVD varied significantly with BMI. Report from Nepal[14] was consistent with our study while one report from Saudi Arabia contradicted our finding. This variation may be due to difference in study population and study design.

Limitation: Sample size was small.

Conclusion:

The mean portal vein diameter of healthy adults in the Sylhet, North East part of Bangladesh on average is 8.8 mm. Portal vein diameter was significantly higher in males. Among females PVD significantly varied with BMI. Further multicentre study with large sample size is required for establishing the normal diameter among people of country.

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