



Global Advanced Research Journal of Medicine and Medical Sciences (ISSN: 2315-5159) Vol. 6(12) pp. 336-340,
December, 2017 Special Issue
Available online <http://garj.org/garjmms>
Copyright © 2017 Global Advanced Research Journals

Full Length Research Paper

Measurement of Normal Portal Vein Diameter in Sudanese using Ultrasonography

Awadia Gareeballah^{1*}, Ikhlas Abdelaziz Hassan², Maisa Elzaki¹, Sura Salah Ibraheem³,
Babiker Abelwahab² Afraa Siddig² and Salah Ali²

¹Faculty of Radiology Science and Medical Imaging, Alzaiem Alazhari University, P.O Box 1432, Khartoum North Sudan.

²Sudan University of Science and Technology.

³National Ribat University.

Accepted 27 November, 2017

Ultrasonography is a valuable tool in the assessment of porto-systemic pathologies. This was descriptive cross sectional study conducted in Alpolice hospital in Khartoum in the periods from June to August 2017. The problem of study was that there are many different pathological conditions affect the portal vein diameter and ultrasound able to determine normal and abnormal measurement of portal vein. The aim of this study was to measure of normal main portal vein diameter in Sudanese by real time sonography and to correlate measurement with other body parameter. The sampling includes 122 patients came to area of study for other scanning purpose rather than liver or portal vein pathologies or any diseases that can affect on portal vein diameter 63 female and 59 male age range (11-85) year. Sonoline G60s machine with 3.5MHZ sector curvilinear transducer probe was used. Measurements of main portal vein diameter was taken in quiet respiration at the liver hilum before bifurcation, the diameter was taken inner to inner. The age categorized into five groups. Descriptive statistics used to analyze quantitative and qualitative variables (percent and means \pm SD). Person correlations test was used to find correlation between mean main portal vein diameter and age, height, weight, body mass index of the patients. The study found that the mean main portal vein diameter (PVD) in Sudanese population was 10.73 ± 1.47 mm, the mean in age group (10- 15) years was 9.43 ± 1.27 mm, in (16- 30) years was 10.52 ± 1.27 mm, in (31-45) years was 11.21 ± 1.45 mm, in (46-60) was 11.19 ± 1.20 mm, in (61-75) years was 10.20 ± 1.66 mm and in (76-85) years was 8.45 ± 2.47 mm. The mean PVD for male was 11.11 ± 1.38 mm which is slightly more than the diameter for female which was 10.38 ± 1.48 mm. The study found that there was no significant correlation between portal vein diameters with age, body mass index and there was significant positive correlation between portal vein diameter height and weight.

Keywords: PVD , Ultrasonography, Quiet respiration

INTRODUCTION

The portal vein (PV) is formed posterior to the pancreas by the union of the superior mesenteric vein and splenic veins at the level of L2. Its trunk is 5 to 7 cm in length.

The portal triad contains branches of the portal vein, hepatic artery, and bile duct contained within a connective tissue sheath that gives the portal vein an echogenic wall as seen on liver sonographic images. The portal vein is clearly seen on both transverse and sagittal scans. On transverse scans, the main portal vein is a thin-walled circular structure, generally lateral and

*Corresponding Author E-mail: awadhia1978@gmail.com

somewhat anterior to the inferior vena cava. It is often possible to record the splenic vein as it crosses the midline of the abdomen to join the superior mesenteric vein to form the main portal trunk. Thus a long section of the splenic vein can be visualized. Often the right or left portal vein can be seen branching from the portal trunk to enter the hilum of the liver. Portal veins become smaller as they progress into the liver from the porta hepatis. Large radicles situated near or approaching the porta hepatis are portal veins, not hepatic veins. The portal veins are characterized by high amplitude acoustic reflections that presumably arise from the fibrous tissues surrounding the portal triad as it courses through the liver substance. The main portal vein is well seen as a circular anechoic structure to the inferior vena cava. The portal radicle may have many different variations; therefore, it is important to become familiar with their patterns to be able to distinguish them from dilated biliary radicles. (L. Hagen - Ansert (2012). In normal individuals, the portal vein diameter does not exceed 13mm in quiet respiration, measured where the portal vein crosses anterior to the IVC. This assessment is usually conducted with ultrasound views along the long axis of the portal vein. (Steven and Penny, 2011) Respiration and patient position greatly affect the size of the portal vein and its tributaries; therefore, diagnostic measurements must be standardized by examining the patient in the supine position and in a state of quiet respiration (Gemechu et al., 2016). Enlargement of the portal vein is indicative of portal hypertension. (Steven and Penny, 2011) Portal hypertension is the most common complication and also one of the important causes of death in chronic liver diseases. Increased resistance to portal blood flow due to alteration of the hepatic architecture leads to dilatation of portal vein, splenomegaly, and formation of esophageal and gastric varices, variceal hemorrhage, ascites, hypersplenism, encephalopathy. (Carol et al., 2011). Geofery et al 2015 state that the mean portal vein diameter in healthy adults in Northern Nigerians was 9.60 ± 1.41 mm for both sexes, the mean value for males was 9.71 ± 1.42 mm, and 9.35 ± 1.46 mm among females, there was a positive correlation between the PV diameter and Body Mass Index ($P \leq 0.01$). (Geofery et al., 2015)

Nirmalya et al 2015 found that the mean portal vein diameter in North–East Indian in males and females were 9.17 ± 2.33 mm and 8.55 ± 1.90 mm respectively, the diameter correlated with weight and BMI in total adult population and females but in males none of the body parameters were correlated significantly. (Nirmalya et al., 2015). Ademola et al 2014 evaluate the mean normal portal vein diameter among healthy Nigerian and found that no significant correlation between measured values age, gender, body mass index (Ademola et al., 2014).

METHODOLOGY

Descriptive cross-sectional was done for measurement of main portal vein diameter in Sudanese population by ultrasonography. The study done within period (June–August 2017) in Al police Hospital in (Khartoum) Sudan. Sample was number of 122 Sudanese, 59 male and 63 female patients admitting to hospital for abdominal ultrasound scans. All patient with normal ultrasound finding of the liver, spleen, biliary system and portal vein included in this study and any abnormal finding in liver and biliary disease excluded from the study. 122 Sudanese patient aged between 11–85 years were included and scan with commercially available real time Siemens sonoline G60s machine using sector curve linear 3.5 MHz transducer probe. The main portal vein is scanned in a sagittal or oblique sagittal plane and the mean of main portal vein diameter was calculated from three measurements for each patient. The patients were scanned in the supine position and in a state of quiet respiration. A standardized data collection sheet design including study variables which were; sex, age, weight, height, Body Mass Index (BMI), portal vein diameter was used. Measurement of portal vein diameter was taken in quiet respiration at the liver hilum before bifurcation. The diameter was taken inner to inner then data analyzed using Statistical Package for Social Science (SPSS). Verbal consent obtained by chief of radiology department for police hospital, then oral consent from each patient, the patient information was handled secretly and used only for study purpose.

RESULTS**Table 1.** Descriptive statistic for Age , height ,weight ,BMI and PVD

	N	Minimum	Maximum	Mean	Std. Deviation
age	122	11	85	40.77	17.261
Height	122	138	189	166.19	9.358
Weight	122	30	121	70.08	17.143
Body Mass Index	122	15.70	46.80	25.4098	6.29644
PVD	122	6.70	13.20	10.7328	1.47303
Valid N (listwise)	122				

Table 2. Compare mean for age , height ,weight ,BMI and PVD and gender

Gender		PVD	age	HT	WT	BMI
Female	Mean	10.3825	38.25	159.87	70.84	27.6032
	N	63	63	63	63	63
	Std. Deviation	1.48395	15.664	6.929	17.623	6.53748
Male	Mean	11.1068	43.46	172.93	69.27	23.0678
	N	59	59	59	59	59
	Std. Deviation	1.37739	18.576	6.464	16.729	5.12022
Total	Mean	10.7328	40.77	166.19	70.08	25.4098
	N	122	122	122	122	122
	Std. Deviation	1.47303	17.261	9.358	17.143	6.29644

Table 3. Compare means and Std. Deviation for PVD Among age group

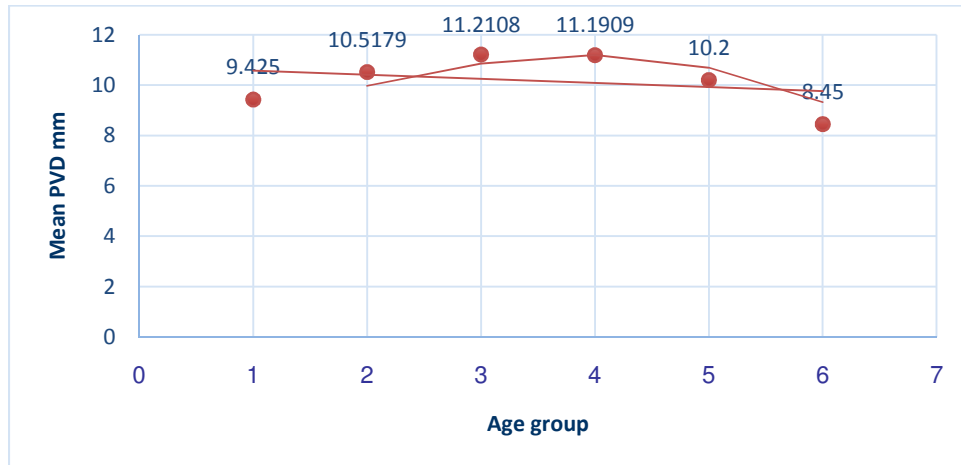
Age group	PVD	
	Mean	Std. Deviation
10-15 years	9.4250	1.26590
16-30 years	10.5179	1.26634
31-45 years	11.2108	1.45369
46-60 years	11.1909	1.20195
61-75 years	10.2000	1.66309
76-85years	8.4500	2.47487
Total	10.7328	1.47303

Table 4. Correlation between PVD ,height ,weight ,age and BMI

		age	Height	Weight	BMI	PVD
PVD	Pearson Correlation	-.036	.289**	.287**	.170	1
	Sig. (2-tailed)	.693	.001	.001	.061	
	N	122	122	122	122	122

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).



1 (10-15 years) . 2(16-30 years). 3(31-45 years). 4(46-60 years).5(61-75 years) .6(76-85 years)

Figure 1. Scatter plot shows mean PVD in different age group

Table 5. Correlation between age , height ,weight ,BMI and PVD and gender for female

		age	HT	WT	BMI	PVD
PVD	Pearson Correlation	-.056	.189	.343**	.323**	1
	Sig. (2-tailed)	.661	.139	.006	.010	
	N	63	63	63	63	63

*Correlation is significant at the 0.05 level (2-tailed).
 **Correlation is significant at the 0.01 level (2-tailed).

Table 6. Correlation between age , height ,weight ,BMI and PVD and gender for male

		age	HT	WT	BMI	PVD
PVD	Pearson Correlation	-.097	.144	.265*	.236	1
	Sig. (2-tailed)	.463	.278	.042	.072	
	N	59	59	59	59	59

**Correlation is significant at the 0.01 level (2-tailed).
 *Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

The study found that the mean portal vein diameter in Sudanese was 10.73 ± 1.47 mm, this results similar to Ethiopian in study done by (Gemechu et al., 2016) and revealed a normal mean portal vein diameter of $10.6 \text{ mm} \pm 1.8 \text{ SD}$ (Gemechu et al., 2016). But the study revealed that PVD more than northern Nigerians in study done (Luntsi et al., 2016) which was 9.60 ± 1.41 mm. The study reveal that PVD in female was 10.38 ± 1.48 mm, in male was 11.11 ± 1.38 mm which also more than Indian and Nigerian in the study done by (Nyrimala et al., 2015; Luntsi et al., 2016) whom found that portal vein diameter in males and females were 9.17 ± 2.33 mm and 8.55 ± 1.90 mm and value for males was 9.71 ± 1.42 mm, and 9.35 ± 1.46 mm among females respectively and seem to

be similar to Ethiopian which in male more than female 10.9 ± 1.9 mm and 10.0 ± 1.5 mm respectively (Gemechu et al (2016). The study found that no significant correlation between portal vein diameter and body mass index which agree to (ademola et al., 2014) in Nigerian, no significant correlation between measured values age, BMI, gender and portal vein. The study revealed that there was significant correlation between height, weight with PVD mm (p value less than 0. 01). Concerning the PVD mm among age group the results found that it was 9.43 ± 1.27 mm, 10.52 ± 1.27 mm, 11.21 ± 1.45 mm, 11.19 ± 1.20 mm, 10.20 ± 1.66 mm and 8.45 ± 2.47 mm for (10-15) years, (16-30) years, (31-45) years, (46-60) years, (61-75) years and (76-85) years respectively, these results clarify that PVD mm increase with age till 45 years then begun to decreased which correspond to study

(Hawaz et al., 2010) in Ethiopian which revealed that the main portal vein was 9.7 ± 2 which increase diameter with increase age. The study clarify that no significant correlation between age and height and PVD mm in female but was significant correlation with weight and BMI (p value less than 0.01). The study demonstrates that no significant correlation between age and height, BMI and PVD mm in male but was significant correlation with weight (p value less than 0.05).

CONCLUSION

The study was conducted to find out the mean PVD in Sudanese population was 10.73 ± 1.47 mm, the study found that the portal vein diameter in (10-15) years was 9.43 ± 1.27 mm, in (16-30) years was 10.52 ± 1.27 mm, in (31-45) years was 11.21 ± 1.45 mm, in (46-60) years was 11.19 ± 1.20 mm, in (61-75) years was 10.20 ± 1.66 mm and in (76- 85) years was 8.45 ± 2.47 mm. The mean PVD in male is slightly more than the diameter for female. The study found that there was no significant correlation between portal vein diameters with participant age, body mass index and there was significant positive correlation between portal vein diameter height and weight.

REFERENCES

- Ademola A, Adeykun AND Harrison B (2014). Garyscale Sonographic Evaluation of Normal Portal Vein Diameter among Healthy Nigerian Adults. *JM* . 13(1):24-17.
- Carol M Rumack, Stephanie R, Wilson J Willim (2011). Charboneau Deborah Levine. *Diagnostic Ultrasound*. 4th edition. Mosby, Inc, an affiliate of Elsevier Inc; Philadelphia. pp. 340, 989.
- Gemechu G, et al (2016). Mean Normal Portal Vein Diameter using Sonography. *Ethiopia J Health sci*. 26(3):237-242.
- Hawaz Y, Admassie D, Kebede T (2012). Ultrasound assessment of normal portal vein diameter in Ethiopians done at Tikur Anbessa specialized hospital. *East and Central Afr. J. Surg*. 17(1):90-93.
- Luntsi G, Sani M, Zira JD, Ivor NC, Garba SH (2016). Sonographic assessment of the portal vein diameter in apparently healthy adults in a northern Nigerian population. *Afr. Health Sci*. 16(4): 1163-1168. <http://dx.doi.org/10.4314/ahs.v16i4.35>
- Nyrmalia Saha, et al (2016) . Portal vein diameter in a tertiary care centre in northern east india. www.iosrjournal.org (IOSR-JDMS). 14(12): 114-117
- Sandra L Hagen - Ansert (2012). *Text book of Diagnostic Sonography* , 7th edition volume one, chapter 9 the vascular system Mosby, Inc., an affiliate of Elsevier Inc; Philadelphia. p. 193-194.
- Steven M, Penny (2011). *Examination review for abdomen, Obstetrics and Gynecology*. Wolter Kluwer; Philadelphia. Page 12-35.