

## A Morphometric Evaluation of the Diameter of Common Bile Duct at Porta Hepatis

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Conflict of interest: Nil

### Abstract

**Aim:** The aim of the present study was to evaluate the measurements of diameter of common bile duct at porta hepatis.

**Methods:** The present study was conducted in the Department of Anatomy, ANMMC, Gaya, Bihar for one year and 100 cases were included in the study group. After examining the abdomen by ultrasound expert, if no hepatobiliary, portal vein pathology is detected then the case is included in the study.

**Results:** The mean age was 36.96 years with standard deviation of 14.96 years. 95% Confidence limit of age are 31.96-37.92 yrs. The mean height was 162.04 cm with standard deviation of 12.88 cm. 95% Confidence limit of height are 5.13-5.33 feet. The mean weight was 54.66 kg with standard deviation of 13.37 kg. 95% Confidence limit of weight are 49.53 - 54.05Kg.

**Conclusion:** Ultrasonic evaluation of common bile duct is important, valuable and diagnostic in most of the biliary disorders such as cholelithiasis and obstruction in jaundice. No parameter like age, height or weight has any impact on size of diameter of common bile duct.

**Keywords:** common bile duct, porta hepatis

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### Introduction

The common bile duct (CBD) is a part of network of structures known collectively as biliary tree, which drains bile from the liver into the second part of the duodenum. It begins at the level where cystic duct joins the common hepatic duct (CHD) and unites distally with the pancreatic duct in a dilated ampulla. The biliary tree also includes the gall bladder, the cystic duct, the right and left hepatic ducts and the common hepatic duct, as well as a series of microscopic biliary ducts within the liver. [1]

The size of the common bile duct is a predictor of biliary obstruction and its measurement is therefore an important component in the evaluation of the biliary system. Availability of a reference range would help to distinguish between medical and surgical jaundice. [2]

Ultrasonographic assessment of the common bile duct has been used in the evaluation of hepatobiliary disease for over thirty years. [3] Although, imaging of the CBD may be undertaken with one or a combination of several modalities including computerized tomography (CT), magnetic resonance pancreatography (MRCP), endoscopic

retrograde cholangiopancreatography (ERCP), ultrasonography has remained the imaging modality of first choice. Ultrasonography is readily available, non-invasive, relatively cheap and uses non-ionizing radiation. Indeed, extrahepatic biliary obstruction can be demonstrated with a degree of accuracy approaching 100% with ultrasonography. [4]

With the development of high resolution scanners, the luminal diameters of the common bile duct can be assessed accurately. The normal internal diameter of the common bile duct on ultrasonography is 6 mm. [5] The determination of adult CBD duct size and its variations with age, [6,7,8,9] gender, body mass index (BMI), post [10,11,12] cholecystectomy and changes with respiration. A common duct greater than 7 mm in diameter is possible in non-jaundiced patients with cholelithiasis, pancreatitis or jaundiced patients with common duct obstruction by stone or tumour. A common duct greater than 11 mm in diameter is strongly suggestive of obstruction.<sup>2</sup> An upper limit of 8 mm appears reasonable after the age of 50; and an upper limit of 10 mm seems appropriate for chole-cystectomized individuals. [13] Sonographic CBD diameter assessment may be

used in every situation where its diameter affects further treatment and prognosis; hence a need to establish CBD reference values for our population using ultrasonography which is a useful non-invasive, readily available and cheap procedure for accurate hepatobiliary and pancreatic assessment. [14]

The aim of the present study was to evaluate the measurements of diameter of common bile duct at porta hepatis.

**Materials and Methods**

The present study was conducted in the Department of Anatomy, ANMMC, Gaya, Bihar, India for one year and 100 cases were included in the study group. After examining the abdomen by ultrasound expert, if no hepatobiliary, portal vein pathology is detected then the case is included in the study.

Diameter of common bile duct at porta hepatis is noted in millimetres. Other parameters height in meters and weight in kilogram were noted. And then using the formula given below for Body surface area

is calculated:  $A = W^{0.425} \times H^{0.725} \times 71.84$  (constant) Sq.M. A is body surface area in square meters, W is weight in kilogram Kg, H is height in meters. All 100 cases were correlated with the parameters such as age, weight and height.

Ultrasound scan: The patient had to fast a minimum of eight hours before the examination so that bowel gas get limited and gall bladder was not contracted. The examination of abdomen was done in supine and in oblique position with the transducer of 3.5 MHz. To conduct the proper ultrasound without any fallacy of abdomen, the patients were called in the morning on empty stomach. Because bowels are relatively empty. History, clinical examination was correlated with the ultrasound observation. As per standard procedure, scan was undertaken in supine position from midline from above downwards and left to right. Particular site of interest can be seen by real time sonography. Standard oblique view was taken of liver, pancreas, etc. Porta hepatis is viewed in longitudinal scan and diameter of common bile duct is measured.

**Results**

**Table 1: Demographic data**

VARIABLE	MEAN	STD. DEVIATION	95% C.I.
Age	36.96 years	14.96 years	31.96-37.92 yrs
Height	162.04 cm	12.88 cm	156.36 - 162.45 cm
Weight	54.66 kg	13.37 kg	49.53-54.05 kg
Body surface area	1.7 Sq.m.	0.36 Sq.m.	1.29 - 1.73 Sq.m.
Common Bile Duct	3.36 mm	0.64 mm	3.21. - 3.49 mm

The mean age was 36.96 years with standard deviation of 14.96 years. 95% Confidence limit of age are 31.96-37.92 yrs. The mean height was 162.04 cm with standard deviation of 12.88 cm. 95%

Confidence limit of height are 5.13-5.33 feet. The mean weight was 54.66 kg with standard deviation of 13.37 kg. 95% Confidence limit of weight are 49.53 - 54.05Kg.

**Table 2: Mean measurements of the diameter of common bile at porta hepatis in different age group**

Age group in years	N	%	CBD in mm
18-30	45	45	3.3
31-40	25	25	3.6
41-50	15	15	3.5
51-60	8	8	3.8
61-70	2	2	3.0
71-80	5	5	4.0

Mean Diameter of portal vein in age group 18-30 years (45 cases) was found to be 3.3 mm, Mean Diameter of portal vein in age group 31-40 years (25 cases) was found to be 3.6 mm, Mean Diameter of portal vein in age group 41-50 years (15 cases) was found to be 3.5 mm, Mean Diameter of portal vein

in age group 51-60 years (8 cases) was found to be 3.8 mm, Mean Diameter of portal vein in age group 61-70 years (2 cases) was found to be 3.0 mm, Mean Diameter of portal vein in age group 71-80 years (5) cases was found to be 4.0 mm.

**Table 3: Correlation of measurements of diameter of common bile duct with height and weight**

Height	N	%	CBD in mm
120-135	3	3	3.1
136-150	22	22	3.2
151-165	52	52	3.5
166-180	23	23	3.6
Weight			
31-40	20	20	3.3
41-50	32	32	3.6
51-60	28	28	3.4
61-70	12	12	3.4
71-80	6	6	3.8
81-90	2	2	3.2

Mean measurement of diameter of common bile duct in the group of 120-135 cm (cases 3) was 3.1 mm, Mean measurement of diameter of common bile duct in the group of 136-150 cm (cases 22) was 3.2 mm, Mean measurement of diameter of common bile duct in the group of 151-165 cm (cases 52) was 3.5 mm, Mean measurement of diameter of common bile duct in the group of 166-180 cm (cases 23) was 3.6 mm. Mean measurement of diameter of common bile duct in the group of 31-40 kg (cases 20) was 3.3

mm, Mean measurement of diameter of common bile duct in the group of 41-50 kg (cases 32) was 3.6 mm, Mean measurement of diameter of common bile duct in the group of 51-60 kg (cases 28) was 3.4 mm, Mean measurement of diameter of common bile duct in the group of 61-70 kg (cases 12) was 3.4 mm, Mean measurement of diameter of common bile duct in the group of 71-80 kg (cases 6) was 3.8 mm.

**Table 4: Correlation of Mean measurements of common bile duct with body surface area**

Age group in years	N	%	CBD in mm
1.00-1.15	3	3	3.4
1.16-1.30	12	12	3.4
1.31-1.45	28	28	3.5
1.46-1.60	27	27	3.3
1.61-1.75	20	20	3.6
1.76-1.90	10	10	3.7

Mean measurement of diameter of common bile duct in the group 1.16-1.30 sq.m (cases 12) was 3.4 mm, Mean measurement of diameter of common bile duct in the group 1.31-1.45 sq.m (cases 28) was 3.5 mm, Mean measurement of diameter of common bile duct in the group 1.46-1.60 sq.m (cases 27) was 3.3 mm, Mean measurement of diameter of common bile duct in the group 1.61-1.75 sq.m (cases 20) was 3.6 mm, Mean measurement of diameter of common bile duct in the group 1.76-1.90 sq.m (cases 10) was 3.7 mm.

### Discussion

Common bile Duct is formed by the union of common hepatic duct and cystic duct just below the porta hepatis. Common bile duct opens on the major papilla in the posteromedial wall of the duodenum. [15] Common bile duct is dilated in case of cholelithiasis, jaundice with obstruction. [16] Evaluation of common bile duct can be done by various radiological procedures. But ultrasound is safe, simple non-invasive method in hepatobiliary diseases ultrasound is first line of investigation. [17]

In jaundiced patients, ultrasound is the main to identify the biliary tract disease to distinguish dilated from non-dilated biliary ducts. Thus diameter of common bile is important ultrasonic measure in the evaluation of hepatobiliary disorders. [18]

The mean age was 36.96 years with standard deviation of 14.96 years. 95% Confidence limit of age are 31.96-37.92 yrs. The mean height was 162.04 cm with standard deviation of 12.88 cm. 95% Confidence limit of height are 5.13-5.33 feet. The mean weight was 54.66 kg with standard deviation of 13.37 kg. 95% Confidence limit of weight are 49.53 - 54.05Kg. Mean Diameter of portal vein in age group 18-30 years (45 cases) was found to be 3.3 mm, Mean Diameter of portal vein in age group 31-40 years (25 cases) was found to be 3.6 mm, Mean Diameter of portal vein in age group 41-50 years (15 cases) was found to be 3.5 mm, Mean Diameter of portal vein in age group 51-60 years (8 cases) was found to be 3.8 mm, Mean Diameter of portal vein in age group 61-70 years (2 cases) was found to be 3.0 mm, Mean Diameter of portal vein in age group

71-80 years (5) cases was found to be 4.0 mm. The anomalous junction of the cystic duct with the common bile duct may cause stagnation of bile. [19] Cystic duct anatomic variants (such as the cystic junction radial orientation variant) can be a source of confusion during surgery if unrecognized. [20] Low junction patients with a short CBD experience several complications, including congenital dilation of the cystic duct. [19] Choledochocoele is a cystic or diverticular dilatation of the lower bile duct and is sometimes associated with cholangitis or pancreatitis. [21]

Mean measurement of diameter of common bile duct in the group of 120-135 cm (cases 3) was 3.1 mm, Mean measurement of diameter of common bile duct in the group of 136-150 cm (cases 22) was 3.2 mm, Mean measurement of diameter of common bile duct in the group of 151-165 cm (cases 52) was 3.5 mm, Mean measurement of diameter of common bile duct in the group of 166-180 cm (cases 23) was 3.6 mm. Mean measurement of diameter of common bile duct in the group of 120-135 cm (cases 3) was 3.1 mm, Mean measurement of diameter of common bile duct in the group of 136-150 cm (cases 22) was 3.2 mm, Mean measurement of diameter of common bile duct in the group of 151-165 cm (cases 52) was 3.5 mm, Mean measurement of diameter of common bile duct in the group of 166-180 cm (cases 23) was 3.6 mm. Mean measurement of diameter of common bile duct in the group of 31-40 kg (cases 20) was 3.3 mm, Mean measurement of diameter of common bile duct in the group of 41-50 kg (cases 32) was 3.6 mm, Mean measurement of diameter of common bile duct in the group of 51-60 kg (cases 28) was 3.4 mm, Mean measurement of diameter of common bile duct in the group of 61-70 kg (cases 12) was 3.4 mm, Mean measurement of diameter of common bile duct in the group of 71-80 kg (cases 6) was 3.8 mm. In a study by Bachar et al [22] on the effect of aging on the adult extra-hepatic bile ducts using ultrasonography. They found significant correlation between CBD size and age.

Mean measurement of diameter of common bile duct in the group 1.16-1.30 sq.m (cases 12) was 3.4 mm, Mean measurement of diameter of common bile duct in the group 1.31-1.45 sq.m (cases 28) was 3.5 mm, Mean measurement of diameter of common bile duct in the group 1.46-1.60 sq.m (cases 27) was 3.3 mm, Mean measurement of diameter of common bile duct in the group 1.61-1.75 sq.m (cases 20) was 3.6 mm, Mean measurement of diameter of common bile duct in the group 1.76-1.90 sq.m (cases 10) was 3.7 mm.

### Conclusion

Ultrasonic evaluation of common bile duct is important, valuable and diagnostic in most of the biliary disorders such as cholelithiasis and obstruction in jaundice. No parameter like age,

height or weight has any impact on size of diameter of common bile duct.

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