



Original Article

Measurement of Weight of Human Liver of North-East Bangladeshi People – A Postmortem Study

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Abstract:

Background: Bangladesh as a developing country, with the advancement of treatment and diagnostic facilities especially in the field of radiology and imaging like Ultrasonography and CT need to revive interest in the cadaveric study of morphological features of liver. While the liver demonstrates remarkable resilience during aging, there is growing evidence that it undergoes all the cellular hallmarks of aging, which increases the risk of liver and systemic disease. A sound knowledge of the normal and variant liver anatomy is a prerequisite for having a favorable treatment outcome. The liver is an accessory gland of the gastrointestinal tract but it has a remarkable diversity of other functions unrelated to alimentation. **Methods:** A Cross-sectional study was conducted in the Department of Anatomy, Sylhet M.A.G. Osmani Medical College, Sylhet on 50 human liver that were collected from unclaimed and examined dead bodies from the Department of Forensic Medicine, Sylhet M.A.G. Osmani Medical College, Sylhet, for one year. The collected samples were divided into 4 groups upon age. Morphological study was carried out on relatively 50 samples. Then statistical analysis was done by SPSS. **Results:** The mean weight of the liver was 960.9 gm (SD ± 303.9); 1130.4 gm (SD ± 189.1); 1209.2 gm (SD ± 323.6) and 1006.5 gm (SD ± 209.5) in the age group of 2 to 15 years, 16 to 30 years, 31 to 45 years and 46 to 75 years respectively with ($P < 0.001$). Whereas the mean weight of the liver was 1059.1 gm (SD ± 358.8) in male and 1033.9 gm (SD ± 220.6) in female ($P = 0.785$). **Conclusion:** There were changes in the values of weight of liver.

Key words: Liver, Morphology, Weight, Volume, Cadaver

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Introduction:

The liver is an accessory gland of the gastrointestinal tract but it has a remarkable diversity of other functions unrelated to alimentation. It is situated in the upper right quadrant of the abdominal cavity, lies to a large extent under the shelter of the lower ribs, its upper surface conforming to the lower surface of the diaphragm^{1,2,3}.

The liver is the largest internal organ in the human body known as “the custodian of the milieu interieur” weighing about 1-1.5 kg and representing 1.5-2.5 % of the lean body mass^{4,5}. The size and shape of the liver may be long and lean or squat and square which is variable and generally match with the general body shape⁴. The growth of liver size corresponds with age which reaches in a plateau around 18 years and after that gradual decrease in weight from middle age. The size of the liver also varies according to age, sex and body size^{6,7,8}.

The liver presents anatomical and physiological right, left, caudate, quadrate and sometimes Riedel’s lobe. Anatomically right and left lobe is divided, antero-superiorly by the attachment of falciform ligament and postero-inferiorly by the fissure for ligamentum teres and venosum. Caudate and quadrate lobes belong to anatomical right lobe. Physiologically both lobes are separated by cholecysto-venacaval line and are supplied respectively by the right and left branches of portal vein, hepatic artery and the hepatic ducts. Physiologically caudate and quadrate lobes belong to the left lobe of the liver^{9,10,11,12}.

The Liver is a mixed gland and has a wide variety of functions. Three of its basic functions are production and secretion of bile and bile salts to help digestion and absorption of fat, metabolism of glucose, amino acids, lipids, fatty acids and cholesterol etc.; production of insulin like growth factor (IGF-I),

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production of various clotting factors, inactivation of various toxins, steroids and other hormones, production of urea, filtration of the blood, removing bacteria and other foreign particles that have gained entrance to the blood from the lumen of the intestine. The liver synthesizes heparin, an anticoagulant substance and has an important detoxicating function. It produces bile pigments from the hemoglobin of red blood corpuscles^{9, 10, 11}.

Materials and Methods:

Human livers were collected from the unclaimed dead bodies autopsied in the Department of Forensic medicine in Sylhet M.A.G. Osmani Medical College, Sylhet for one year meeting the inclusion and exclusion criteria included in the study. The collected samples were divided into 4 groups, Group-A: 2 to 15 years; Group-B: 16 to 30 years; Group-C: 31-45 years Group-D: 46 to 75 years, according to age. Again each group (Group – A, B, C, D) was subdivided into Male and Female depending upon their sex.

Procedure of measurement of weight: The weight of the liver means presence of mass of liver tissue. Before weighing the surface of each liver was dried with tissue paper. Then it was weight by means of an analytical balance (C A B digital scale, made in china) in grams (Figure-1).



Figure-1: Measurement of liver by digital weighing scale

Table-I: Distribution of weight of liver by different age group

Weight of liver (gm)	Age Group				p-value
	Group-A (n=11)	Group-B (n=13)	Group-C (n=16)	Group-D (n=10)	
Mean ± SD	960.9 ± 303.9	1130.4 ± 189.1	1209.2 ± 323.6	1006.5 ± 209.5	P<0.001
Range	235-1060	860-1410	770-1710	710-1370	

Group-A: 2 to 15 years; Group-B: 16 to 30 years; Group-C: 31-45 years Group-D: 46 to 75 years

Results:

The mean weight of the liver was 1049.5 (SD ± 311.2) gm. It was 960.9 gm (SD ± 303.9) in the age group of 2 to 15 years; 1130.4 gm (SD ± 189.1) in the age group of 16 to 30 years; 1209.2 gm (SD ± 323.6) in the age group of 31 to 45 years and 1006.5 gm (SD ± 209.5) in the age group of 46 to 75 years (P<0.001). The difference among the groups were statistically significant (F=6.597; P <0.001). The mean weight of the liver was 1059.1 gm (SD ± 358.8) in male and 1033.9 gm (SD± 220.6) in female (P=0.785). Distribution of weight of liver by different age group is shown in Table-I & Table-II.

Table-II: Distribution of weight of liver by sex.

Weight of liver (gm)	Sex		P- value
	Male (n=31)	Female (n=19)	
Mean ± SD	1059.1 ± 358.8	1033.9 ± 220.6	P= 0.785
Range	235 - 171	630 - 1530	

Discussion:

The present study reflects that the weight of the liver ranged from 235 to 1710 gm with the mean 1049.5 (SD ± 311.2) gm. similar result was observed in several other studies. The weight of the liver described by Mescher Ross and Moore et al. as 1500g^{8,9,13}. Kumar (2005) found that the weight of the liver was 1400-1600 gm¹⁴. The mean weight of the liver in this study was 960.9 gm (SD ± 303.9) in the age group of 2 to 15 years; 1130.4 gm (SD ± 189.1) in the age group of 16 to 30 years; 1209.2 gm (SD ± 323.6) in the age group of 31 to 45 years and 1006.5 (SD ± 209.5) in the age group of 46 to 75 years. The difference among the groups was statistically significant (p<0.001).

Similar results were observed in the study of Sultana, that mean weight of the liver was 552.86 ± 101.37 gm in the age group of up to 15 years; 1045 ± 34.39 gm in the age group of 16 to 30 years; 1135 ± 68.09 gm in the age group of 31 to 45 years and 1009.34 ± 52.73 gm in the age group of 46 to 75 years^{15,16,17}. Sherlock and Dooley reported that the mean weight of the liver of adult was 1200 to 1500 gm which was nearly similar with the age group of

adult in the present study¹³. In this study the mean weight of the liver was 1059.1 gm (SD \pm 358.8) in male and 1033.9 gm (SD \pm 220.6) in female. Though the mean weight of the liver of male was heavier than that of female but the difference was not significant ($p=0.785$). Nearly similar finding was observed in the study of that Sultana reported that the mean weight of the male liver (1022.18 ± 44.41 gm) was heavier than that of female (785.40 ± 86.55 gm)^{12,18,19,20}. Datta also reported that the mean weight of the liver was 1400-1800 gm in male and 1200-1400 gm in female^{21,22,23,24}.

In the current study the diameter of the hepatocytes were increased up to the age of 45 years then decreased. There exist some similarities and some variations in the findings of different parameters. In cases of variations the findings of the present study were less than the findings of other countries. The variations may be due to racial difference of the study populations. In this study the specimen were preserved in 10.0% formol saline that may be caused some amount of shrinkage of the specimens and subsequent lower value in some of the parameters in comparison to others reports in western books where the parameter were supposed to be from fresh specimen. Further studies on larger populations and different sex and ethnicity may be done to establish a complete data of Bangladeshi population.

Conclusion:

In this study a significant association is observed between age and weight of the liver. All these morphological and histological parameters are not varied with sex. There exist some similarities and some variations in the findings of different parameters. In cases of variations the findings of the present study were less than the findings of other countries. The variations may be due to racial difference of the study populations. In this study the specimen were preserved in 10.0% formol saline that may be caused some amount of shrinkage of the specimens and subsequent lower value in some of the parameters in comparison to others reports in western books where the parameter were supposed to be from fresh specimen. Further studies on larger populations and different sex and ethnicity may be done to establish a complete data of Bangladeshi population.

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