Morphometric Measurements of Heart in Adult Male Bangladeshi People In Relation to the Age and Height of the Individual

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Abstract

Context: Standardization of heart morphometry in Bangladeshi Bangali population might help for the proper choice for surgical intervention and prosthetic replacement in cardiac surgery. Having this context in mind the study was carried out on hearts of adult Bangali male people.

Study design: A descriptive type of study

Place and period of study: Department of Anatomy, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from February 1999 to May 1999.

Materials: Thirty seven (37) apparently normal postmortem hearts of adult Bangladeshi Bangali males, collected from the morgue of Department of Forensic Medicine, Dhaka Medical College, Dhaka.

Method: Age of the subject was noted from the concerned department. Length of the deceased was measured with a measuring tape from the level of vertex to the outer border of heel.

Length (from apex to base) and breadth (at broadest diameter) of the heart were measured with slide calipers. Weight was measured with weighing machine.

Result: The length of the hearts varied from 9.38 to 12.30 cm with mean value 11.10 ($\pm$ 0.46) cm. Breadth varied from 6.81 to 11.50 cm with mean value 9.38 ($\pm$ 1.03) cm. Weight ranged from 150 to 394 gm with mean value 235.92 ($\pm$ 41.72) gm.

Length of the heart showed a non-significant positive correlation with the age of an individual but a significant positive correlation with the height.

Key words: Heart, Age, Height

Introduction:

Cardiac diseases fall among the common causes of disability and morbidity in developing countries like Bangladesh. In Bangladesh, both reconstructive and replacement operations of diseased cardiac valves are common practice these days. The results of these surgical procedures have been satisfactory. It may be noted that the choice of proper reconstructive intervention and prosthetic replacement might require the normal morphometric measurements of heart in relation with general body parameters, like age and height.

In most of textbooks the mentioned anatomic variations are based on the studies of North American or European people. But these variations often differ among the various human groups. Bangladeshi Bangali population might have their own range of variations in heart morphometry. So far this has been studied in a very few instances on the formalin fixed postmortem hearts in Bangladesh. This present study was done on fresh postmortem hearts of Bangali adult males.

Materials and Method:

The study was done on 37 apparently normal postmortem hearts of Bangali males. The samples

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were collected from unclaimed dead bodies autopsied at the mortuary of Department of Forensic Medicine of Dhaka Medical College, Dhaka. The subjects were adult male aged 20 years or above and not known to have died from any cardiac disease. The samples were collected within 24 hours from death.

The age of the subject was noted from the record as supplied by the concerned department. The length of the deceased was measured, with a measuring tape, from the level of its vertex to the outer border of the heel at the line of lateral malleolus. This measure represented the height of the individual.

As for the routine postmortem examination the heart and pericardium were exposed. The outer layers of pericardium were cut to expose the heart, which was pulled downward to cut it from the roots of the great vessels. Inferior vena cava was then cut just above the diaphragm. Pulmonary vessels were cut away from the hilum of lung. The heart was then removed. It was then washed thoroughly with normal saline and gently squeezed to remove blood, as much as possible, from its chambers and vessels. After proper cleaning of heart the excess saline was removed from the chambers and was dried by blotting paper. Measurements were then taken.

Length: The length was measured from the apex of the heart to a point on the base, just left to the midway between the two right pulmonary veins. The measurement was taken with slide calipers.

Breadth: The breadth was measured at the broadest part of the transverse diameter of the heart. The measurement was taken by slide calipers.

Weight: The weight of the heart was measured with weighing machine in gram (gm).

The data collected were processed to get mean values, standard deviation (SD) and appropriate statistical analyses were done through regression analysis. The level of significance was set at 5% level ($P \leq 0.05$).

Result:
The length of hearts ranged from 9.38 to 12.30 cm with mean ($\pm$SD) value 11.10 ($\pm$0.46) cm (Table-I).

In about 4/5th of total hearts the length varied from 10.50 to 12 cm. The breadth of hearts ranged from 6.81 to 11.50 cm with mean ($\pm$SD) value 9.38 ($\pm$1.03) cm (Table-I). In more than half of total hearts the breadth varied from 9 to 10.50 cm. The weight ranged from 150 to 394 gm with mean ($\pm$SD) value 235.92 ($\pm$41.73) gm (table 1). In more than 4/5th of total hearts the weight varied from 200 to 300 gm.

Table-I
Measurements of the hearts in Bangladeshi Bangali population (n = 37).

| Parameter	Measurement	
	Range	Mean $\pm$ SD
Length (cm)	9.38 – 12.3	11.10 $\pm$ 0.46
Breadth (cm)	6.81 – 11.5	9.38 $\pm$ 1.03
Weight (gm)	150 – 394	235.92 $\pm$ 41.72

The length of the hearts had a non-significant positive correlation with the age (r=0.286, P>0.05) (Fig.-1) but a significant positive correlation with the height (r=0.357, P<0.05) of the individuals (Fig. 2). On the other hand, the weight of the hearts had significant positive correlation with both age (r=0.411, P<0.05) and height (r=0.416, P<0.05) of the individuals (Fig. 3 & 4).
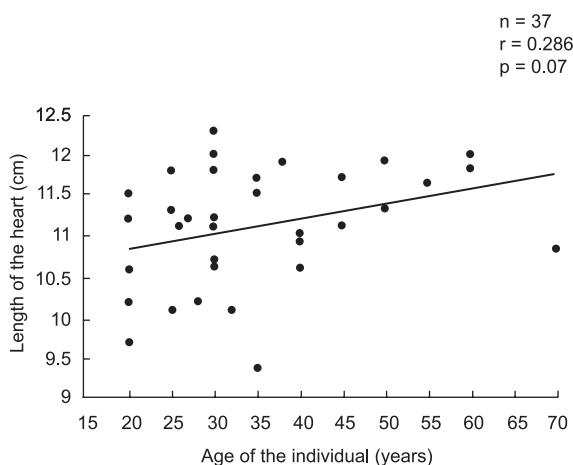
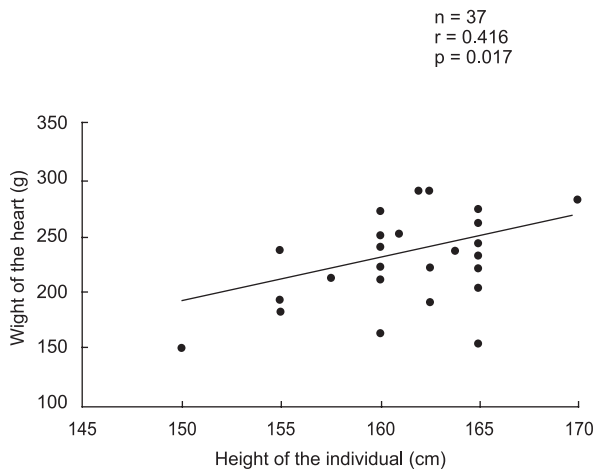**Fig.-1:** *Scatter diagram showing a non-significant (P>0.05) positive correlation of length of hearts with age of individuals.*

81

n = 37
r = 0.357
p = 0.025
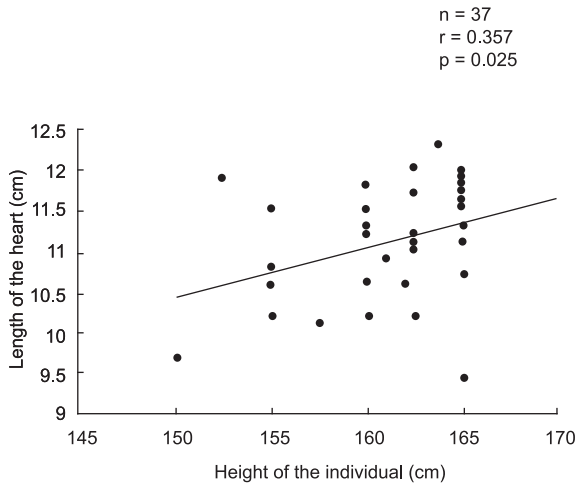
Fig.-2: *Scatter diagram showing a significant (P<0.05) positive correlation of the length of hearts with the height of individuals.*

n = 37
r = 0.411
p = 0.015
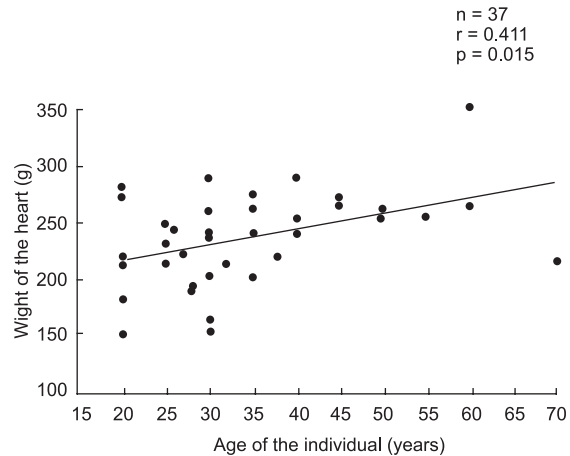
Fig.-3: *Scatter diagram showing significant (P<0.05) positive correlation of the weight of hearts with the age of individuals.*

n = 37
r = 0.416
p = 0.017

Fig.-4: *Scatter diagram showing a significant (P<0.05) positive correlation of the weight of hearts with the height of individuals.*

Discussion:

The length and breadth of the hearts, in this study, were almost similar to those noted by Bashir (1988)[1], Rahman (1989)[2] and Begum (1996)[3] who studied on formalin fixed hearts from Bangladeshi population. Nevertheless, as compared with the mean values of length and breadth in this study (11.10 cm & 9.38 cm) were slightly higher than that of these authors (10 to 11 cm & 8 to 9 cm). Formalin fixation might cause the shrinkage of the hearts. On the contrary, Sarkar (1996)[4], though studied on

formalin fixed hearts, found the mean length as 11.59 cm and this higher value of length can not be explained. Sarkar[4] noted the mean breadth similar to that found by other authors worked on formalin fixed hearts[1,2,3].

In the western textbooks and literatures, the mean length has been described about 12 cm, the breadth as 8 to 9 cm and the average weight as 300 g or more[5,6,7,8]. Almost all the values of length in the present study clustered below 12 cm Fig.-1 and similarly those of the weight (>97% of hearts) below 300 g (Fig. 3). on the other hand, the majority of the values of breadth (about 65%) were above 9 cm. Morphometric values of hearts in western people can be assumed higher in all dimensions because of their higher body surface area and height, but the mean breadth in the present study is found higher (9.38 cm) than that in western people (9 cm). Basir[1], Rahman[2], Begum[3] and Sarkar[4] also found the mean breadth from 8 to 9 cm in formalin fixed hearts. The present study was done on unfixed, empty hearts and thus the samples were highly malleable. It might have been spread transversely a bit more than the normal.

In the statistical regression analyses the length of heart, though, shows a non-significant positive correlation with age of individual, even that the 'P' value is almost near to the significant value (0.05).

besides these, one value of lengths at the highest age (70 years) found to be very low and this might effect the slop regression line (Fig. 1).

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