

Correlation of Calf Circumference with Body Weight of 5-10 Years Aged Bangladeshi Children

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The cross-sectional, analytic and descriptive type study was conducted among 5-10 years aged Bangladeshi children at different areas of Mymensingh district (Muktagacha, Fulbaria, Trishal, Haluaghat and Fulpur thana) on 109 Bangladeshi children (39 female and 70 male). The study was conducted in the Department of Anatomy, Mymensingh Medical College, Bangladesh. Nonrandom purposive sampling technique was taken for sample collection. Any kind of leg and foot deformity resulting either from congenital anomaly or physical injury was excluded to construct standard data. The present anthropometric study was designed to construct data of 5-10 years aged Bangladeshi children regarding calf circumference, to measure correlation calf circumference (right) with body weight and comparison of calf circumference (right) between male and female children. The study has been made out to grow interest among the researchers for future study and also to compare the data with the data of the people of other races of different country. Body weight was recorded by weighing machine and calf circumference was measured by measuring tape. Calf circumference (right) showed non-significant positive correlation with weight in 5 years old male, 6 and 7 years old male and female, 8 years old male, 9 years old female and 10 years old male and female children. In case of 5 years old female and 9 years old male children, it showed significant positive correlation with weight but in case of 8 years old female, it showed non-significant negative correlation with weight. Comparison of calf circumference (right) between male and female children was done by Unpaired Students' 't' test which was statistically non-significant.

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Key words: Anthropometry, Weight, Calf circumference

Introduction

The lower extremity of human is specialized for support and locomotion. Lower extremity has a hip girdle which is attached to the axial skeleton. The hip girdle supports three segments of the limb- a proximal thigh, a middle leg and a distal foot. The calf muscles refer to that muscles which are located to the posterior portion of the lower leg. The two largest muscles in this region include the gastrocnemius and the soleus. The gastrocnemius is the most superficial and has two head, medial and lateral¹. Anthropometry is a process which is concerned with the measurement and testing of the human body and the relationship of dimensions among its various parts. Leg and foot anthropometry plays an important role designing good fitting footwear. Foot anthropometric measurements are applied to design shoes and stockings should represent a sample of specific population such as children, adult and old people². In our country Bangladesh, we depend on foreign data which came from the subjects of different country and from the individuals under different geographic location. This study was carried out to minimize the

dependency on foreign standards of different foreign country.

Methods

The cross-sectional, analytic and descriptive type study was carried out at Muktagacha, Fulbaria, Trishal and Haluaghat Thana of Mymensingh from January 2016 to December 2016 in the Department of Anatomy, Mymensingh Medical College, Mymensingh, Bangladesh.

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After taking all formalities of ethical clearance from respective Institutional Review Board (IRB) on 12th March 2016, this study was performed. Total 109 Bangladeshi children (70 male and 39 female) were selected for the study. At the beginning of the study each child was greeted politely. Then the guardian was informed about the total plan of the study and its implication and about the entire spectrum of benefits. Written consent was taken from the parents or legal guardian of the children. Then the weight of the

children was recorded by weighing machine. The children were requested to wear light cloths, take off their shoes, remove things from pockets and stand straight on the digital weighing machine. Then the reading was recorded in kilogram. Calf circumference was measured with the flexible measuring tape at the widest point of the calf. Measuring tape was sided up and down to find this point. The subject sat with knee placed in the semi flexed position³.



Figure 1: Procedure of measurement calf circumference by flexible measuring tape

Results

The mean calf circumference of right side of 5, 6, 7, 8, 9 and 10 years aged male children were 20.77 ± 1.70 cm, 20.56 ± 1.35 cm, $21.47 \pm .99$ cm, 21.81 ± 1.57 cm, 22.93 ± 1.31 cm and 23.47 ± 2.28 cm respectively and those of female children were 20.17 ± 2.36 cm, 20.57 ± 1.70 cm, 21.44 ± 1.1 cm, 21.38 ± 1.14 cm, 22.02 ± 3.40 cm and 22.23 ± 1.27 cm respectively. The mean calf circumference of left side of 5, 6, 7, 8, 9 and 10 years aged male children were 20.75 ± 1.72 cm, 20.55 ± 1.36 cm, $21.47 \pm .99$ cm, 21.81 ± 1.57 cm, 22.92 ± 1.32 cm and 23.46 ± 2.28 cm respectively and those of female children were 20.16 ± 2.35 cm, 20.57 ± 1.70 cm, 21.43 ± 1.1 cm, 21.38 ± 1.14 cm, 22.02 ± 3.40 cm and 22.18 ± 1.26 cm respectively.

Table I: Calf circumference (Right) in different age and sex groups

Variable	Age (years)	Sex	Measurement in cm	
			Range	Mean±SD
Calf circumference (Right)	5	Male	17.80-23.00	20.77±1.70
		Female	16.40-24.00	20.17±2.36
	6	Male	19.00-23.00	20.56±1.35
		Female	19.00-22.80	20.57±1.70
	7	Male	20.00-23.10	21.47±0.99
		Female	20.00-23.20	21.44±1.10
	8	Male	19.00-25.00	21.81±1.57
		Female	20.00-23.00	21.38±1.14
	9	Male	20.60-24.40	22.93±1.31
		Female	18.30-26.20	22.02±3.40
10	Male	20.00-28.00	23.47±2.28	
	Female	20.90-24.50	22.23±1.27	

Table II: Calf circumference (Left) in different age and sex groups

Variable	Age (years)	Sex	Measurement in cm	
			Range	Mean±SD
Calf circumference (Left)	5	Male	17.70-23.00	20.75±1.72
		Female	16.40-24.00	20.16±2.35
	6	Male	19.00-23.00	20.55±1.36
		Female	19.00-22.80	20.57±1.70
	7	Male	20.00-23.10	21.47±0.99
		Female	20.00-23.20	21.43±1.10
	8	Male	19.00-25.00	21.81±1.57
		Female	20.00-23.00	21.38±1.14
	9	Male	20.60-24.40	22.92±1.32
		Female	18.30-26.20	22.02±3.40
10	Male	20.00-28.00	23.46±2.28	
	Female	20.90-24.50	22.18±1.26	

The mean weight of 5, 6, 7, 8, 9 and 10 years aged male children were 19.55±3.68 kg, 18.08±3.08 kg, 22.22±1.26 kg, 21.67±2.79 kg, 24.95±4.11 kg and 28.56±5.30 kg respectively and those of female children were 16.93±4.02 kg, 22.25±.50 kg, 20.39±2.85 kg, 24.84±4.25 kg, 24.22±8.22 kg and 26.50±7.12 kg respectively.

Table III: Body weight in different age and sex groups

Variable	Age (years)	Sex	Measurement in Kg	
			Range	Mean±SD
Weight	5	Male	11.10-23.50	19.55±3.68
		Female	11.00-22.00	16.93±4.02
	6	Male	14.00-23.20	18.08±3.08
		Female	22.00-23.00	22.25±0.50
	7	Male	21.80-26.00	22.92±1.26
		Female	17.20-25.00	20.39±2.85
	8	Male	19.10-30.00	21.67±2.79
		Female	20.10-30.00	24.84±4.25
	9	Male	19.60-32.00	24.95±4.11
		Female	15.00-35.00	24.22±8.22
10	Male	20.10-36.00	28.56±5.30	
	Female	20.00-40.00	26.50±7.12	

Table IV: Correlation between body weight and calf circumference (Right) in different age and sex groups

Variable	Age (years)	Sex	Correlation with weight	
			r	p value (2-tailed)
Right calf circumference (cm)	5	Male	0.576	0.064
		Female	0.792	0.011
	6	Male	0.576	0.064
		Female	0.166	0.834
	7	Male	0.050	0.898
		Female	0.428	0.217
	8	Male	0.551	0.051
		Female	-0.483	0.410
	9	Male	0.804	0.003
		Female	0.931	0.069
	10	Male	0.356	0.193
		Female	0.473	0.237

Calf circumference (right) showed non-significant positive correlation with weight in 5 years old male (r=0.576, p=0.064), 6 years old male (r=0.576, p=0.064) and female (r=0.166, p=0.834), 7 years old male (r=0.050, p=0.898) and female (r=0.428, p=0.217), 8 years old male (r=0.551, p=0.051), 9 years old female (r=0.931, p=0.069) and 10 years old male (r=0.356, p=0.193) and female (r=0.473, p=0.237). In case of 5 years old female (r=0.792, p=0.011) and 9 years old male (r=0.804, p=0.003), it showed

significant positive correlation with weight but in case of 8 years female ($r=-0.483$, $p=0.410$), it showed non-significant negative correlation with weight.

Comparison of calf circumference (right) of 5-10 years aged male and female children

Table V: Significance of difference of calf circumference (right) of 5-10 years aged male and female children

Age (years)	Mean difference	Standard error difference	p value
5	0.594	0.910	0.522
6	-0.011	0.842	0.989
7	0.037	0.483	0.939
8	0.435	0.779	0.584
9	0.911	1.168	0.449
10	1.235	0.878	0.174

In case of 5, 7, 8, 9 and 10 years old children, calf circumference (right) was larger in male children but in case of 6 years old children, it was larger in female children.

Discussion

According to the present study, the mean calf circumference of right side of 5, 6, 7, 8, 9 and 10 years aged male children were 20.77 ± 1.70 cm, 20.56 ± 1.35 cm, 21.47 ± 0.99 cm, 21.81 ± 1.57 cm, 22.93 ± 1.31 cm and 23.47 ± 2.28 cm respectively and that of left side were 20.75 ± 1.72 cm, 20.55 ± 1.36 cm, 21.47 ± 0.99 cm, 21.81 ± 1.57 cm, 22.92 ± 1.32 cm and 23.46 ± 2.28 cm respectively. On the other hand, the right mean calf circumference of same aged female children were 20.17 ± 2.36 cm, 20.57 ± 1.70 cm, 21.44 ± 1.1 cm, 21.38 ± 1.14 cm, 22.02 ± 3.40 cm and 22.23 ± 1.27 cm respectively and that of left side were 20.16 ± 2.35 cm, 20.57 ± 1.70 cm, 21.43 ± 1.1 cm, 21.38 ± 1.14 cm, 22.02 ± 3.40 cm and 22.18 ± 1.26 cm respectively. Boucher conducted a study on lower extremity anthropometry and described right mean calf circumference as 22.9 ± 2.1 cm and that of left as 22.7 ± 2.2 cm which was more or less similar to the findings of 9 years old male group of the present study⁴. McDowell et al. conducted a study on anthropometric reference data for children and adults in United States during 2003 to 2006 and described mean calf circumference for children aged 8, 9 and 10 years as 28 cm, 28.6 cm and 30.4 cm respectively which was higher than the present study according to the age⁵. Correlation between calf circumference (right) and body weight was done. Comparison of right calf circumference between male and female children was done by Unpaired Students 't' test which was

statistically non-significant. Study regarding correlation between calf circumference and body weight and study regarding comparison of calf circumference (right) between 5-10 years aged male and female Bangladeshi children was not available to compare with this study.

Conclusion

In this study, calf circumference (right) showed non-significant positive correlation with weight in 5 years old male, 6 and 7 years old male and female, 8 years old male, 9 years old female and 10 years old male and female children. In case of 5 years old female and 9 years old male children, it showed significant positive correlation with weight but in case of 8 years female children, it showed non-significant negative correlation with weight. Comparison of calf circumference (right) between male and female children was done by Unpaired Students 't' test which was statistically non-significant. In case of 5, 7, 8, 9 and 10 years old children, calf circumference (right) was larger in male children but in case of 6 years old children, it was larger in female children.

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Original contribution

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