

Skinfold Thickness of Government Primary School Children in Dhaka City

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Abstract

Context: Skinfold thickness is one of the important parameter to assess nutritional status which is widely used in children. It is the common technique for estimating fat mass in children. We can also use measurement of skinfold thickness in children for clinical, research and epidemiological purposes. The present study was planned to determine difference in skinfold thickness between boys and girls of four government primary school in Dhaka city.

Materials & Methods: A cross-sectional analytical type of study was conducted in the department of anatomy, Dhaka Medical College, Dhaka, from January 2012 to December 2012. The present study was performed on 400 government primary school children. Out of 400 children, 200 were boys and 200 were girls. The study population was divided into three groups A, B, C according to age and sex of the subject. Group A include age 9+ years, group B include age 10+ years and group C include age 11+ years old children. Each group was again subdivided into A₁, B₁ and C₁ for boys and A₂, B₂ and C₂ for girls. The subjects of this age group were the students of class III to class V. With the help of skinfold caliper measurements were recorded.

Results: Triceps, subscapular, suprailiac and medial calf skinfold of group A₂, B₂ and C₂ were significantly greater ($P < 0.001$) than group A₁, B₁ and C₁.

Key words: skinfold thickness, primary school children.

Introduction

Skinfold thickness is a simple means of estimating body composition which is widely used in children¹. Now a days childhood obesity is a common health problem in Bangladesh because of its association with increased risk of hypertension, coronary heart disease, diabetes and certain types of cancer. Skinfold thickness is also a good method to measure level of fatness because it directly measures subcutaneous fat layers². By measuring skinfold thickness we can assess the nutritional status of a child. Very low values of skinfold thickness indicate the depleted calorie reserves of the body and are correlated with malnutrition. Thus

a variation in subcutaneous fatness is a good predictor of health and chronic diseases³. Many illnesses related with fatness can be managed by study of skinfold thickness. Skinfold thickness is also used to calculate anthropometric somatotype⁴.

Under the influence of the gonadal steroid hormones and growth hormone, the deposition of fat becomes maximally sexually dimorphic. Due to the influence of testosterone, boys have a simultaneous loss of fat in the limbs⁵. Prepubertal girls have greater levels of circulating estrogen than prepubertal boys that suggests a role of it in differences of fat distribution between both sexes⁶.

Materials & methods

The study population was selected purposively from four government primary school in Dhaka city. The subjects of this age group were the students of class III to class V. Out of 400 children, 200 were boys and 200 were girls. The guardian of the study population was either small entrepreneur or third

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and fourth class employee of government and non-government organization. The monthly income of parents/ father/ mother/family was ranged from 15,000 to 20,000. Each student was provided with an ID no. and a data sheet of personal information's was filled up for each student. So, there was no scope of repetition of students participating in the study. All the students of the class were included but data were collected only from those who fulfilled the criteria and participated willingly. Informed written consent was taken from the headmaster of the respective school and also from parents of the students for data collection. Date of birth of subjects was taken from the birth certificates which were collected from the office of the respective school. If birth certificates were not available from the school, then the date of birth of the students were collected from the parents. Age and sex wise distribution of sample is given in Table I. Those subjects who had completed 9 years of age but were less than 10 years even by one day were grouped under 9+ age group. Similar pattern was followed for other age groups as well. To take measurement of skinfolds proper exposure was needed. Before exposure privacy was maintained. The measurement was taken in closed door room with the presence of an attendant (aya) of the respective school.

Skinfolds were measured by skinfold caliper in mm. A fold of skin and subcutaneous tissue was firmly raised between thumb and forefinger of the left hand and away from the underlying muscle at the marked site. Then the skinfold caliper was placed 1cm below the fingers of the left hand to measure thickness of the fold. During measurement the subject was asked to stand relaxed, except for the medial calf skinfold which was taken with the subject seated⁷.

Triceps skinfold was taken with the subject's arm hanging loosely in the anatomical position. A line was drawn at the back of the arm connecting the acromion and the olecranon processes. A midpoint of the line was determined. Then a fold was raised at the determined site and measurement was taken⁷.

Subscapular skinfold was taken by raising the fold on a line from the inferior angle of the scapula in a direction that was obliquely downwards and laterally at 45 degrees⁷.

A point was taken 5-7 cm above the anterior superior iliac spine at the junction of a line to the anterior axillary border and a diagonal line going downwards and medially at 45 degrees. Then suprailliac skinfold was measured by raising the fold at the point⁷.

Maximum girth of the calf was determined on the medial side of the leg. Then medial calf skinfold was taken by raising a vertical fold at the maximum girth of the calf⁷.

Table I
Distribution of sample by age and sex

Group	Age limit (yrs)	No. of sample	Total
A ₁ (Boys)	9+	68	136
A ₂ (Girls)	(9 to <10)	68	
B ₁ (Boys)	10+	66	132
B ₂ (Girls)	(10 to <11)	66	
C ₁ (Boys)	11+	66	132
C ₂ (Girls)	(11 to <12)	66	
Total			400

Ethical clearance

The study was approved by Ethical Review committee of Dhaka Medical College, Dhaka.

Results

Results are showing in Table II, III, IV, V and Figure 1, 2, 3,4.

Table-II
Triceps skinfold of boys and girls of government primary school

Group	Triceps skinfold (mm) (Mean±SD)
A ₁ (n=68)	6.02±1.57(4.00 12.00)
A ₂ (n=68)	8.18±2.69(4.00 16.00)
<i>P value</i>	0.0001***
B ₁ (n=66)	6.52±2.28(2.50 12.00)
B ₂ (n=66)	8.28±2.70(4.00 20.00)
<i>P value</i>	0.0001***
C ₁ (n=66)	6.97±2.15(4.00 12.00)
C ₂ (n=66)	9.14±2.74(4.00 18.00)
<i>P value</i>	0.0001***

Table-III
Subscapular skinfold of boys and girls of government primary school

Group	Subscapular skinfold (mm) (Mean±SD)
A ₁ (n=68)	4.51±1.15(2.00 9.00)
A ₂ (n=68)	5.85±2.27 (3.00 14.00)
<i>P value</i>	0.0001***
B ₁ (n=66)	4.64±1.73(2.00 10.00)
B ₂ (n=66)	6.95±2.51(2.50 16.00)
<i>P value</i>	0.0001***
C ₁ (n=66)	5.10±1.71(3.00 11.00)
C ₂ (n=66)	7.53±2.67(3.75 16.00)
<i>P value</i>	0.0001***

Table-IV
Suprailiac skinfold of boys and girls of government primary school

Group	Suprailiac skinfold(mm) (Mean±SD)
A ₁ (n=68)	4.29±1.44(2.00 9.00)
A ₂ (n=68)	6.11±2.28(2.25 14.00)
<i>P value</i>	0.0001***
B ₁ (n=66)	4.32±2.12(2.00 10.50)
B ₂ (n=66)	6.73±2.35 (3.00 14.00)
<i>P value</i>	0.0001***
C ₁ (n=66)	5.23±2.24(2.00-12.00)
C ₂ (n=66)	7.64±3.01 (3.00 16.00)
<i>P value</i>	0.0001***

TableV
Medial calf skinfold of boys and girls of government primary school

Group	Medial calf skinfold(mm) (Mean±SD)
A ₁ (n=68)	6.01±1.78(3.00 12.00)
A ₂ (n=68)	7.98±2.37(3.00 12.00)
<i>P value</i>	0.0001***
B ₁ (n=66)	7.16±2.26(2.25 14.00)
B ₂ (n=66)	8.15±2.76 (3.00 18.00)
<i>P value</i>	0.026*
C ₁ (n=66)	7.66±2.49(4.00-14.00)
C ₂ (n=66)	8.73±3.15(3.00 18.00)
<i>P value</i>	0.031*

Figures in parentheses indicate range. Comparison between boys and girls done by unpaired Student's 't' test, * = significant at P<0.05, *** = significant at P<0.001

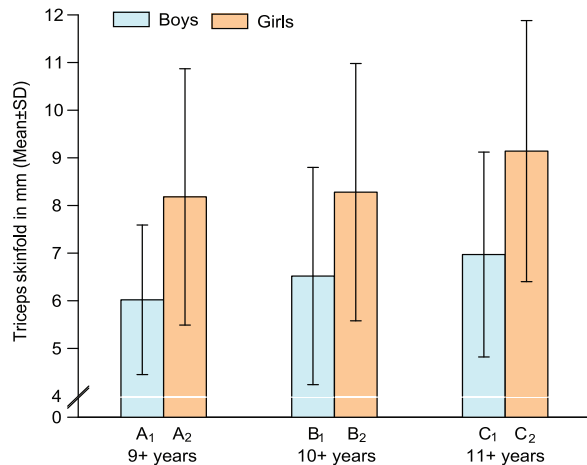


Fig.-1 Triceps skinfold of boys and girls of government primary school

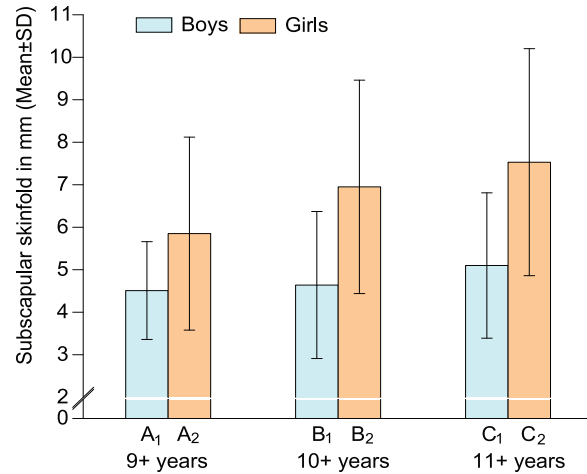


Fig.-2 Subscapular skinfold of boys and girls of government primary school

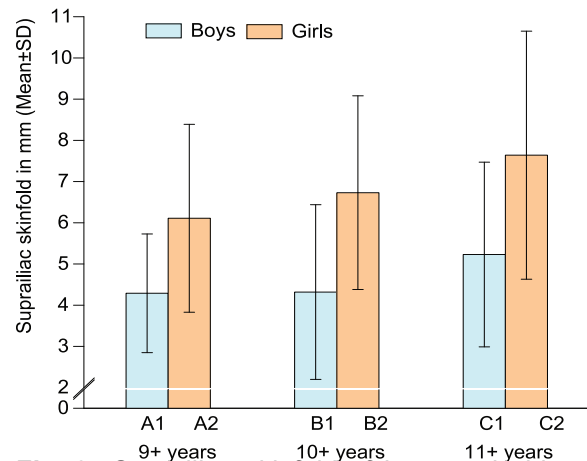


Fig.-3: Suprailiac skinfold of boys and girls of government primary school

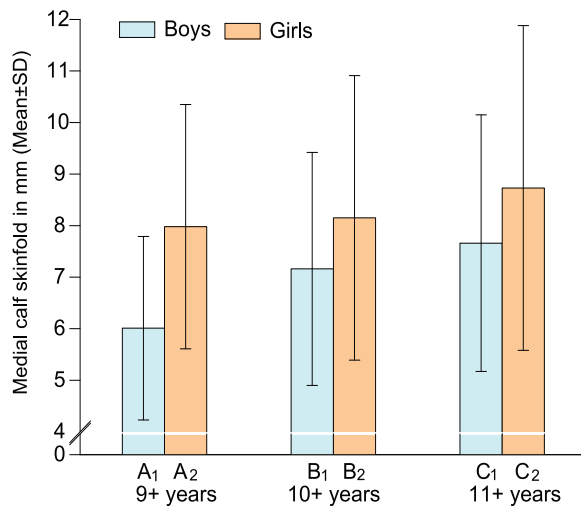


Fig.-4: Medial calf skinfold of boys and girls of government primary school

Discussion

In the present study, triceps skinfold of group A₂, B₂ and C₂ were significantly higher than group A₁, B₁ and C₁ (P<0.001). The findings of Chan, et al.⁸, Wickramasinghe, Lamabadusuriya, Cleghorn and Davies⁹, Yeung and Hui¹⁰ and He, et al.⁶ were significantly higher than the findings of the present study (P<0.001). In this study, subscapular skinfold of group A₂, B₂ and C₂ were significantly higher than group A₁, B₁ and C₁ (P<0.001). The findings of Bhasin and Jain³ were statistically not significant to the findings of the present study (P>0.05). This similarity may be due to same socio-economic condition of the study populations. Wickramasinghe, Lamabadusuriya, Cleghorn and Davies⁹, Yeung and Hui¹⁰ and He, et al.⁶ reported significantly higher values than the values of the present study (P<0.001). In the present study, suprailiac skinfold of group A₂, B₂ and C₂ were significantly higher than group A₁, B₁ and C₁ (P<0.001). The findings of Wickramasinghe, Lamabadusuriya, Cleghorn and Davies⁹, Yeung and Hui¹⁰ and He, et al.⁶ were significantly higher values than the values of the present study (P<0.001). In the present study, medial calf skinfold of group A₂, B₂ and C₂ were significantly higher than group A₁ (P<0.001), group B₁ and C₁ (P<0.05). The findings of Yeung and Hui¹⁰ and He, et al.⁶

were significantly higher values than the values of the present study (P<0.001). Dissimilarities of the findings of the present study with the findings of the other researchers may be due to the selection of study population of different age group, different socio-economic status, different nutritional status and different categories like sportsman.

Conclusion

Further studies with larger sample size are recommended to get more precise picture in order to produce a more comprehensive data in different age group of male and female in Bangladesh. Studies with different category of people like sportsman, industrial worker, day laborer are also recommended.

References:

1. Reilly JJ, Wilson J, Durnin JVGA. Determination of body composition from skinfold thickness: a validation study. *Archives of Diseases in Childhood*, 1995; 73: 305-10.
2. Widiyani T, Suryobroto B, Budiarti S, Hartana A. The growth of body size and somatotype of Javanese children age 4 to 20 years. *Hayati Journal of Biosciences*, 2011; 18(4): 182-92.
3. Bhasin MK, Jain S. Biology of the tribal groups of Rajasthan, India. 2. Physical growth and anthropometric somatotypes. *Anthropologist*, 2007; 9(3): 177-87.
4. Rahmawati NT. Somatotypes of Javanese soccer and volleyball players in Yogyakarta. *Berkala Limu Kedokteran*. 2003; 35(3): 157-64.
5. Rogol AD, Clark PA, Roemmich JN. Growth and pubertal development in children and adolescents: effects of diet and physical activity. *American Journal of Clinical Nutrition*, 2000; 72: 521-28.
6. He Q, et al. Sex and race differences in fat distribution among Asian, African-American and Caucasian prepubertal children. *The Journal of Clinical Endocrinology and Metabolism*, 2002; 87(5): 2164-70.

7. Carter JEL. *The Heath-Carter anthropometric somatotype-instruction manual*. [Online] Surrey, Canada: Tep and Rosscraft. Available at: www.somatotype.org/Heath-Carter Manual.pdf. 2002. [Accessed 24 June 2012].
8. Chan DFY et al. New skinfold-thickness equation for predicting percentage body fat in Chinese obese children. *Hong Kong Journal of Paediatrics*, 2009; 14(2): 96-102.
9. Wickramasinghe VP, Lamabadusuriya SP, Cleghorn GJ, Davies PSW. Assessment of body composition in Sri Lankan children: validation of a skinfold thickness equation. *Ceylon Medical Journal*, 2008; 53(3): 82-88.
10. Yeung DC, Hui SS. Validity and reliability of skinfold measurement in assessing body fatness of Chinese children. *Asia Pacific Journal of Clinical Nutrition*, 2010; 19(3): 350-57.