Original article

Assessment of body composition of government primary school children in Dhaka city

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Abstract

Objective : Parameters of the body composition such as percentage of body fat and total body fat are often used to evaluate physical abilities. These parameters are also used to assess nutritional status which is widely used in children. We can also use measurement of percentage of body fat and total body fat in children for clinical, research and epidemiological purposes. The present study was planned to determine difference in percentage of body fat and total body fat between boys and girls of four government primary school in Dhaka city.

Materials & Methods : This 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 A_1, B_1 and C_1 for boys and A_2, B_2 and C_2 for girls. The subjects of this age group were the students of class III to class V. With the help of weighing scale and skinfold caliper measurements were recorded.

Results : Percentage of body fat and total body fat of group A_2, B_2 and C_2 were significantly greater ($P<0.001$) than group A_1, B_1 and C_1.

Conclusion : Studies with larger sample size could be necessary to identify more accurate results in different age groups among different population.

Key words : Body composition, total body fat, percentage of body fat.

Introduction

The assessment of body composition in childhood can be performed with several sophisticated techniques, but in many circumstances it is more desirable to utilize widely available and simple techniques such as anthropometry[1]. Measurement of body composition is proving increasingly important in clinical nutrition and research[2]. It is essential for monitoring childhood obesity in the world[3]. Assessment of total body fat and percentage of body fat is important in the management of illnesses like obesity, cardiovascular diseases and type 2 diabetes mellitus[4]. It is also a good method to measure level of fatness because it directly measures subcutaneous fat layers by measuring skinfold thickness[5].

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Different body size, shape and proportions are beneficial in different physical activities. Physical abilities of the players have marked effects on the skill of players and the tactics of the team. To evaluate these physical abilities, parameters of the body composition such as the percent body fat and somatotype components are often used[6].

Very low values of skinfolds indicate the depleted calorie reserves of the body and are correlated with malnutrition. Thus, variations in body mass, subcutaneous fatness and total body fat are good predictors of health and chronic diseases[7].

A marked change in body composition is the hallmark of pubertal maturation and result in typical male-female differences. 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 limbs[8].

Prepubertal girls have greater levels of circulating estrogen than prepubertal boys that suggests a role of it in differences of fat distribution between both sexes[9].

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. 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 weight and 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.

Weight was measured by weighing scale in kg. The subject was only with school dress without any extra clothing and extra things like pen, pencil, scale, water bottle, tiffin box in his/her hands or pockets. The subject was asked to stand bare footed on the scale facing forward. While both feet placed on the scale, weight was evenly distributed between the feet.

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 seated.

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 taken[10].

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 degrees[10].

Percentage of body fat (BF%) was calculated by Slaughter et al equations[2].

Boys=1.21 (sum of 2 skinfolds) - 0.008 (sum of 2 skinfolds)^2 - 1.7

Girls =1.33 (sum of 2 skinfolds) -0.013 (sum of 2 skinfolds)^2 - 2.5

[BF% for children with triceps and subscapular skinfolds <35 mm]

Boys = 0.783 (sum of 2 skinfolds) -1.7

Girls = 0.546 (sum of 2 skinfolds) + 9.7

[BF% for children with triceps and subscapular skinfolds >35 mm]

Total body fat was calculated by following formula[6].

Total body fat (kg) = (Percentage of body fat / 100) x Body mass (kg)

Results

Results are showing in Table 1, 2, 3

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)	(11to<12)	66	
Total			**400**

Table 2 : Percentage of body fat of boys and girls

Group	Percentage of body fat (Mean±SD)
A_1(n=68)	10.10±2.47(6.37 20.18)
A_2(n=68)	13.30±4.37(6.17 25.70)
P value	0.0001***
B_1(n=66)	10.69±3.72(3.87 21.04)
B_2(n=66)	14.28±3.99 (7.58 29.35)
P value	0.0001***
C_1(n=66)	11.71±3.55(6.37 22.73)
C_2(n=66)	15.71±4.65 (4.33 26.23)
P value	0.0001***

Table 3 : Total body fat of boys and girls

Group	Total body fat (kg) (Mean±SD)
A_1(n=68)	2.55±0.75 (1.28 5.85)
A_2(n=68)	3.32±1.30 (1.11 7.96)
P value	0.0001***
B_1(n=66)	2.85±1.27(1.04 6.63)
B_2(n=66)	4.41±2.12 (1.59 14.38)
P value	0.0001***
C_1(n=66)	3.38±1.35(1.53 8.07)
C_2(n=66)	5.35±2.47 (1.68 12.27)
P value	0.0001***

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

Discussion

In the present study, percentage of body fat of A2, B2 and C2 were higher than A1, B1 and C1 (P<0.001). Total body fat of A2, B2 and C2 were higher than A1, B1 and C1 (P<0.001).The findings of Chan, et al., Wickramasinghe, Lamabadusuriya, Cleghor n and Daviesand Yeung and Hui were significantly higher than the findings of the present study (P<0.001)[3,4,11]. The guardian of the study population was either small entrepreneur or third 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.

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

Only four government primary schools were included in this study. So the children of the present study do not represent all primary school children of Bangladesh. 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 are also recommended.

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