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Body composition of rural preadolescent girls of Kanpur Nagar

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ABSTRACT

The assessment of body composition in adolescence can be performed with several sophisticated techniques but in many circumstances it is more desirable to utilized widely available and simple techniques such as anthropometry. This would allow quick determination of body composition without the need for specialized laboratories, radiation exposure or expensive equipment. Anthropometric assessment of body composition was done using standard tools and techniques Lohman *et al.* (1988). The study instruments consisted of a structured questionnaire containing general information of the respondents, non –stretchable measuring tape for MUAC, and waist hip measurement. Harpenden caliper for skin fold thickness measurement at four sites *viz.,* triceps, biceps, subscapular and suprailiac sites MUAC of rural girls ranged from 14.5 to 25.20 cm with the mean value of 18.16 ±2.45 cm in 10- 12 years. It was found that PBF in rural girls increased linearly with age. Overall increase in PBF was 1.8 from 10-12 years.

Key Words : Physical growth, Nutritional status, Rural preadolescent girls

INTRODUCTION

Nutritional anthropometry is universally applicable, simple, inexpensive and non-invasive technique, but it is still an underutilized tool for guiding public health policy. Growth monitoring by anthropometric measurements during preadolescence growth period is not only an important health indicator but also a predictor of various morbidities in the community. Anthropometric indices are of increasing importance in nutritional assessment as these measurements are easy, quick and accurate. The pattern of physical growth is similar in all individuals but the rate varies depending upon various genetic and environmental factors.

Adolescents are the best human resources. The adolescent girls are very important section of our society as they are our potential mothers and future homemakers. In this

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period of rapid growth, if a girl is not taken care of, this influences the state of her health throughout life. About 450 million adult women in developing countries are stunted as a result of childhood protein energy malnutrition (Sinha, 2001). For many years, their health has been neglected because they were considered to be less vulnerable to disease than the young children or the very old. Their health attracted global attention in the last decade only (Kalhan *et al.*, 2010). Non availability of data on body composition of 10-12 year old rural girls of Kanpur nagardistrict prompted to undertake the present study.

Rural India needs more attention as 98 per cent of the geographical area of India and 72.9 per cent of India's population occupy rural area spreading over six lakh villages. India consists of diverse agro-climatic regions and ethnic multiplicities. Socio-cultural practices, lifestyles and eating habits vary not only between states but also between the districts within a state. In India there is wide variation in the growth determinants, it is essential that the normal values are developed region wise and are redefined from time to time (ICMR, 1994).

Updated profiles on physical growth and nutritional status of children especially rural girls are therefore, important for formulation and implementation of appropriate nutrition intervention strategies and policies not only at the state level but also at district and tehsil levels.

METHODOLOGY

In the present study 200 school girls of age 10-12 years were selected using random purposive sampling. Exact age of the subjects was verified from the school records. Rural subjects selected were from villages of *Kalyanpur* block of Kanpur *Nagar* district. Anthropometric assessment of body composition was done using standard tools and techniques Lohman *et al.* (1988). The study instruments consisted of a structured questionnaire containing general information of the respondents, non –stretchable measuring tape for MUAC, and waist hip measurement. Harpenden caliper for skinfold thickness measurement at four sites *viz.,* triceps, biceps, subscapular and suprailiac sites. Waist Hip Ratio (WHR), Sum of four skinfold thickness, Percentage Body Fat (PBF), Fat Mass (FM), Fat Free Mass (FFM), Fat Mass Index (FMI) and Fat Free Mass Index (FFMI) were computed using raw measurements taken in field.

WHR was calculated by dividing waist circumference and hip circumference, Sum of four skinfold thickness by adding skinfold thickness at triceps, biceps, subscapular and suprailiac and PBF by equation (Deurenberg, 1990).

Per cent body fat (PBF) = 29.85 [$\log_{10}$ of sums of biceps, triceps, subscapular and suprailiac skinfolds (mm)] – 25.87.

Value derived from PBF was used to calculate Fat Mass (FM), Fat Free Mass (FFM), Fat Mass Index (FMI) and Fat Free Mass Index (FFMI) and were computed using following equations :

FM (kg) = (PBF/100) × Weight (kg)

FMI (kg/m^2) = FM (kg)/height^2 (m)

FFM (kg) = Weight (kg) – Fat mass (kg)

FFMI (Kg/m^2) = Fat free mass (kg) – height^2 (m)

Statistical Analysis :

Mean, standard deviation and percentile values were used

RESULTS AND DISCUSSION

General information:

Age group of 10- 12 years was divided in to three age's *i.e.* 10, 11 and 12 years. Age means completed years. The subjects included in the study are whose parents and teachers/ mentors gave permission and had no objection in recording the data. Analysis of the data reveals that 30 per cent rural preadolescent girls were 10 years old, 38 per cent are 11 years old and remaining 32 per cent were in their 12th year of life. Family income per month of rural families ranged from Rs. 2,000 to 20,000 per month. It was found that maximum number of families has monthly income between Rs. 5,001 to 10,000. Out of total families 35.5 per cent were earning less than Rs. 5,000 per month. Number of the family members living under one roof was recorded to assess the family size of the rural girls. Family size of the studied families ranged from 4 to 15. It was found that 40.5 per cent families were having 3 to 4 members in their family, 45 per cent having 5 to 6 members and only 1 per cent family were having more than 10 members in the family.

Table 1 : Personal profile of the subjects (n=200)

Sr. No.	Personal variables			
1.	**Age (years)**	**10**	**11**	**12**
	Percentage (%)	30	38	32
2.	**Religion**			
	Hindu	28	35.5	28.5
	Muslims	02	2.5	3.5
3.	**Caste**			
	General	12	11	9.5
	OBC	12.5	15.5	13.5
	SC	5.5	11.5	9.0
4.	**Father's Education**			
	uneducated	0	0	0
	Primary (up to V)	3.0	2.0	6.5
	Secondary (VI to IX)	14.5	16.0	9.0
	10^{th} class	4.5	10	12
	10+2	8.0	9.0	4.5
	Graduate	0	1.0	0
	Post Graduate	0	0	0

Anthropometric assessment of body composition:

MUAC of rural girls ranged from 14.5 to 25.20 cm with the mean value of 18.16 ±2.45cm in 10- 12 years. Comparison with NCHS standard reveals that 50th percentile of MUAC in 10- 12 years old rural girls of present study is comparable with the 10th percentile of NCHS standard. Mean of MUAC in present study is significantly less than the NCHS standard. Bhaketia and Jain (2007) reported mean± SE MUAC of the rural girls in 10 years

was 17.2±0.04 and for 11 years was 17.7±0.02 cm being 81.5 and 79 per cent of NCHS standards, respectively.

Waist circumference of 10-12 years old rural girls ranged from 40.60 to 66.0 cm with the average waist circumference of 53.15± 4.33 cm. Hip circumference of rural girls ranges from 56.20 to 81.20 cm in the ages of 10- 12 years. WHR shows that as the girls are moving towards 11 years and 12 years intra abdominal fat is found to depleting indicating negative energy balance. Ghosh and Bandyopadhyay (2013) studied central adiposity in healthy Hindu girls aged 5-16 years studying in urban public school at Howrah, West Bengal and reported mean waist circumference 50.62 cm and hip circumference 77.38 cm.

Table 2 : Mean, standard deviation and 50th percentile of MUAC, WC, HC and WHR of subjects

Age (Year)	MUAC (cm)		Waist Circumference(cm)		Hip Circumference (cm)		Waist Hip Ratio (WHR)	
	Mean	50th Percentile	Mean	50th Percentile	Mean	50th Percentile	Mean	50th Percentile
10	18.16± 2.45	17.70	53.60± 4.38	54.50	66.46± 3.59	67.15	0.81± 0.04	0.81
11	18.59± 2.16	18.55	52.94± 3.67	52.45	66.17± 3.26	66.40	0.80± 0.05	0.80
12	17.94± 2.35	17.75	52.93± 4.96	52.95	66.65± 4.30	67.40	0.79± 0.04	0.79

Skinfold Thickness of Subjects:

Skinfold consists of two layers of subcutaneous fat without any muscle or tendon. Mean standard deviation and 50th percentile of triceps, biceps, subscapular and suprailiac skinfold thickness of rural girls is presented in Table 3 which shows that skinfold thickness at triceps, biceps, subscapular and suprailiac sites is linearly increased with the age.

Table 3 : Mean, standard deviation and 50th percentile of skinfold thickness at triceps, biceps, subscapular and suprailiacof rural girls

Age	Skinfold thickness							
	Triceps		Biceps		Subscapular		Suprailliac	
	Mean± SD	50th Percentile	Mean± SD	50th Percentile	Mean± SD	50th Percentile	Mean± SD	50th Percentile
10	8.13 ±0.81	8.00	8.88 ±0.42	8.90	12.12 ±0.97	12.00	14.05 ±1.20	14.00
11	8.37 ±0.67	8.20	9.09 ±0.31	9.10	12.46 ±0.85	12.40	14.41 ±1.15	14.30
12	8.33 ±0.80	8.30	9.95 ±0.76	10.05	14.18 ±1.45	14.40	16.40 ±1.85	16.25

It was found that PBF in rural girls increased linearly with age. Overall increase in PBF was 1.8 from 10-12 years (Table 3). An increase of only 620g wasfound in fat mass of girls in two years gap. De (2017) reported fat mass increase 4.03 kg from 10 to 19 years. Dhobal and Raghuvanshi (2014) reported that On the basis of body fat-for-age percentiles, 14.77 per cent subjects were found overweight and 3.64 per cent were obese.

Table 4 : Distribution of body composition of rural girls

Age (years)	PBF		FM (Kg)		FMI		FFM		FFMI	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
10	22.91	0.91	6.35	1.53	3.42	0.60	21.22	4.34	11.46	1.49
11	23.27	0.70	6.76	1.43	3.59	0.51	22.24	4.26	11.81	1.39
12	24.49	1.22	6.97	1.70	3.74	0.67	21.33	4.31	11.47	1.53

Conclusion:

The study concludes that MUAC of rural girls was found to increase at 10 and 11 years whereas hip circumference, per cent body fat increased linearly with age.

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