Anthropometric assessment and BMI index of obese children in Kanpur district of Uttar Pradesh

■ ANCHAL SINGH **and** VINITA SINGH

See end of the paper for
authors' affiliations

Correspondence to :
ANCHAL SINGH
Department of Food and Nutrition,
Punjab Agricultural University,
LUDHIANA (PUNJAB) INDIA

The word obese is derived from the Latin word "obese" which means "to eat". Obesity occurs when a positive balance develops between the energy intake and expenditure. The obesity in children and adolescents is gradually becoming a major public health problem. Obese children are those who are 20 per cent above the normal weight for age. They are more prone to become overweight adults as the tendency of obesity in such children persists throughout the life. The risk of obesity is two to three times greater for an individual with a family history of obesity and increases further with severe obesity. In addition infants born to overweight mothers have been found to be less active and gain more weight by age three months when compared with infants of normal weight mothers suggesting a possible inborn derive to conserve energy. Childhood obesity has emerged only recently in India, unlike in the West where it existed since long. Obesity in children as young as two years onwards have been reported from the Indian population (Sharma, 2002). The present study was planned to investigate anthropometric profile in the obese children.

Location of study:

The study was conducted in Government School Kanpur District of Uttar Pradesh in 2007.

Selection of subject:

Statistically adequate samples of 100 subjects in the group of 8-13 yrs were randomly selected from Govt. Schools in Kanpur District of Uttar Pradesh.

Collection of data:

A well- structured questionnaire-cum-interview schedule was developed to elicit the information of adolescent girls.

Nutritional status:

Nutritional status of obese children was assessed by Anthropometric measurement *viz.,* height, weight, BMI, MUAC and TST.

Anthropometric assessment:

Measurement of body weight, body height, BMI, mid-upper arm circumference (MUAE) triceps skin fold thickness were recorded by the technique suggested by (Gibson, 1990).

Technique for measuring body weight:
A weighing machine with maximum capacity of 120 kg and the minimum division of 0.5 kg was used to weight the subject.

Technique for measuring body height:
Height was measured with vertical measuring rod (anthropometric). The anthropometric rod with centimetre scale having least count of 0.1 cm was used for measuring

height.

Body mass index (BMI):

BMI is calculated as:

$$BMI = \frac{Wt\,(kg)}{Ht2\,(m)}$$

BMI is the most reliable index of measuring the obesity.

Technique for measuring mid-upper arm circumference (MUAC):

A fibre glass measuring tape was used with least count of 0.1 cm. The left hand sleeve of the garment of the subject was pushed up to the shoulder.

Technique for measuring triceps skin fold thickness (TST):

For measuring the triceps skin fold thickness the adipometer skin fold calliper was used. It is scientifically designed to provide accurate measurements.

Statistical analysis:

Appropriate statistical tools were applied for analysis.

Table 1 reveals the mean height of obese children in different age groups. In male of 8 to 10 years of age group, 126.6 cm height was found which was 4.23 per cent lower from the NCHS standards. In 10-12 years of age group, children were having 141.9 cm height which was 1.01 cm lower than NCHS standard. In above 12 years of age group, children were having 146.0 cm height which was 3.98 per cent lower from the NCHS standards. In female of 8-10 years of age group, 131.4 cm height was found which was 0.64 cm

lower than the NCHS standards. In 10-12 years of age group children were having 139.1 cm height which was 3.96 per cent lower from the NCHS standards; up to 12 years of age group children were having 147.0 cm height which was 4.9 per cent lower from the NCHS standards. The value of correlation for male obese children is 0.6189 which was significant at 5 per cent level of significance. The value of correlation for female obese children is 0.6632, which was significant at 5 per cent level of significance. Observations indicate that the height of obese children was considerably lower than the expected height.

Table 2 reveals the mean weight of obese children in different age group. In male of 8 to 10 years of age group, 37.4 kg weight was found which was 32.62 per cent higher from the NCHS standards. In 10-12 years of age group, children were having 49.2 kg weight which was 38.98 per cent higher than NCHS standards. In above 12 years of age group, children were having 59.3 kg weight which was 42.3 per cent higher form the NCHS standards. In female of 8 to 10 years of age group, 37.0 kg weight was found which was 29.59 per cent higher from the NCHS standards. In 10-12 years of age group, children were having 49.3 kg weight which was 33.42 per cent higher from the NCHS standards. In above 12 years of age group, children were having 59.2 kg weight which was 35.15 per cent higher from the NCHS standards. The value of correlation for male obese children is 0.6967 which was significant at 5 per cent level of significance. The value of correlation co-efficient for female obese children is 0.5401 which was significant at 5 per cent level of significance. Observations indicate that the weight of obese

Table 1: Mean height of obese children on the basis of age						
Age group (years)	Male obese children			Female obese children		
	Average height (cm)	S.D.	NCHS standard of height (cm)	Average height (cm)	S.D.	NCHS standard of height (cm)
8-10	126.6	8.9	132.2	131.4	6.1	132.25
10-12	141.9	5.2	143.35	139.1	5.1	144.85
Above 12	146.9	5.1	153.0	147.0	5.2	154.6
Mean	140.5	10.1		140.6	7.7	
r =	0.6189* P < 0.05			0.6632 * P < 0.05		

* indicate significance of value at P=0.05

Table 2 : Mean weight of obese children on the basis of age						
Age group (years)	Male obese children			Female obese children		
	Average weight (kg)	S.D.	NCHS standard of weight (kg)	Average weight (kg)	S.D.	NCHS standard of weight (kg)
8-10	37.4	7.7	28.2	37.0	6.2	28.55
10-12	49.2	6.1	35.4	49.3	6.0	36.95
Above 12	59.3	8.5	42.3	59.2	6.0	43.8
Mean	50.8	11.4		51.3	9.4	
r =	0.6967* P < 0.05			0.5401 * P < 0.05		

* indicate significance of value at P=0.05

children was considerable higher than the expected weight. The reason of higher values may be due to consumption of increased amount of junk foods and also due to no physical exercise by the subjects.

Table 3(a) shows the mean body mass index of obese children in different age group. In male of 8 – 10 years of age group, 22.8 kg/m^2 BMI was found which was 50.59 per cent higher from CDC standards. In 10 -12 years of age group, children were having 25.9 kg/m^2 BMI which was 55.2 per cent higher than the standards. In above 12 years of age group children were having 27.4 kg/m^2 BMI which was 56.21

per cent higher than standards. Ahuja *et al.* (2004) studied 604 school going children had risk factor for the development of cardio-vascular diseases.

In female 8 – 10 years of age group, 22.9 kg/m^2 BMI was found which was 44.34 per cent higher from the standards. In 10 – 12 years of age group children were having 25.5 kg/m^2 BMI which was 50.89 per cent higher than CDC standards. In above 12 years of age group, children were having 27.8 kg/m^2 BMI which was 56.18 per cent higher than CDC standards. Chaudhary and Kishore (2004) found degree of obesity (>30% body fat) was prevalent among 30.19 per

Table 3a : Mean body mass index of the obese children according to age group						
	Male obese children			Female obese children		
Age group (years)	Average BMI (kg/m^2)	S.D.	CDC**standard BMI (kg/m^2)	Average BMI (kg/m^2)	S.D.	CDC** standard BMI (kg/m^2)
8-10	22.8	2.3	15.14	22.9	2.9	15.86
10-12	25.9	2.6	16.68	25.5	2.2	16.9
Above 12	27.4	3.2	17.54	27.8	2.3	17.8
Mean	25.8	3.3		25.8	2.9	
r =		0.5132*	P < 0.05		0.6012 *	P < 0.05

* indicate significance of value at P=0.05, ** Centre for Disease Control (CDC) 2000 Standards

Table 3(b) : Mean BMI of obese children on the basis of income group			
Income	Frequency	Average BMI (kg/m^2)	S.D.
5000 – 10,000	21	26.2	2.9
10,000 – 15,000	28	26.2	3.5
15,000 – 20,000	42	26.3	3.0
Above 20,000	9	26.6	2.7
Total		26.32	3.3
r		0.2715* P<0.05	
t		2.793*	

* indicate significance of value at P=0.05

Table 4 : Mean mid upper arm circumference (cm) of obese children according to age group							
	Male obese children				Female obese children		
Age group (years)	Average MUAC (cm)	S.D.	ICMR standard MUAC (cm)	Increment (%)	Average MUAC (cm)	S.D.	ICMR standard MUAC (cm)	Increment (%)
8-10	18.9	1.4	16.50	+14.54	19.6	1.4	16.50	+18.78
10-12	20.8	2.1	17.40	+19.54	21.0	2.2	17.40	+20.68
Above 12	24.4	2.3	20.30	+20.19	24.9	1.5	20.30	+22.66
Mean	23.3	3.1			23.3	2.7		
r =		0.5075*	P < 0.05			0.6126*	P < 0.05	

* indicate significance of value at P=0.05

Table 5 : Mean triceps skin fold thickness (T.S.T) mm2 of obese children according to age group							
	Male obese children				Female obese children		
Age group (years)	Average (T.S.T.) mm^2	S.D.	Average standard** (T.S.T.) mm^2	Increment (%)	Average (T.S.T.) mm^2	S.D.	Average standard** (T.S.T.) mm^2	Increment (%)
8-10	17.5	2.0	15	16.67	20.9	2.4	19	+10.0
10-12	23.7	2.2	19	+27.73	26.7	2.9	23.5	+13.61
Above 12	28.5	3.3	22	+29.54	28.0	3.3	23	+21.73
Mean	24.52	3.4			25.86	4.2		
r =		0.4539*	P < 0.05			0.5571*	P < 0.05	

* indicate significance of value at P=0.05, **Gnanasundaram, S., Ramamurthy, T. and John Britto, J. Manual of practical paediatric nutrition, Dept. of Child Nutrition, Institute of Child Health and Hospital for Children Chennai

cent school children. It was also seen that 80 per cent of adolescent were obese in young and middle age and its influence was seen on mental health resulting in disturbing picture of depression, low self esteem, poor body image and social isolation. It could be due to excess consumption of simple and refined sugars, lack of chewing and junk foods with less dietary fibre.

The value of correlation for male obese children was 0.5132 which was significant at 5 per cent level. The value of correlation for female obese children is 0.6012 which was significant at 5 per cent level.

Table 3b shows that the highest average body mass index (BMI) 26.6 kg/m^2 was found in income group of above 20,000 per month where as the lowest average BMI *i.e.* 26.2 kg/m^2 was found in the income group of 5000-10,000 and 10,000 – 15,000 per month.

The value of correlation co-efficient was 0.2715 which was significant at 5 per cent level of significance.

Table 4 shows the mean mid-upper arm circumference (MUAC) of obese children in different age groups. In male 8-10 years of age group, 18.9 cm MUAC was found which was 14.54 per cent higher from the ICMR standards. In 10 to 12 years of age group, children were having 20.8 cm MUAC which was 19.54 per cent higher from the ICMR standards.

In female 8 to 10 years of age group, 19.6 cm MUAC was found which was 18.78 per cent higher form the ICMR standards. In 10-12 years of age group, children were having 21.0 cm MUAC which was 20.68 per cent higher than ICMR standards. In above 12 years of age group children were having 24.9 cm MUAC which was 22.66 per cent higher from the ICMR standards.

The value of correlation for male obese children was 0.5075 which was significant at 5 per cent level of significance. The value of correlation of female obese children was 0.6126, which was significant at 5 per cent level of significance.

Observation indicates that the MUAC of obese children were considerable higher than the expected MUAC.

Table 5 shows that the mean triceps skinfold thickness

of obese children in different age groups. In male 8-10 years of age group 17.5 mm^2 triceps skin fold thickness (TST) was found which was 16.67 per cent higher than the standards. In 10-12 years of age group children were having 23.7 mm^2 TST which was 27.73 per cent high than standards. In above 12 years of age group children were having 28.5 mm^2 TST which was 28.54 per cent higher than the standards.

In female 8-10 years of age group 20.9 mm^2 TST was found which was 10.0 per cent higher than, the standard. In 10-12 years of age group children were having 26.7 mm^2 TST which was 13.61 per cent higher than standards. In above 12 years of age group children were having 28.0 mm^2 TST which was 21.73 per cent higher than the standards.

The value of correlation for male obese children was which was 0.4539 significant at 5 per cent level of significance. The value of correlation of female obese children is 0.5571 which was significant at 5 per cent level of significance.

Observations indicate that the TST of obese children was considerable higher than the expected TST.

Authors' affiliations:
VINITA SINGH, Department of Food and Nutrition, C.S.A. University of Agriculture and Technology, KANPUR (U.P.) INDIA

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