



ANTHROPOMETRIC INDICES AND ENERGY INTAKE: COMPARISON BETWEEN PRESCHOOLERS

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ABSTRACT:

Anthropometric measurements are important in determining nutritional status of children. Physical measures of preschoolers vary with nutrient intake. This study deals with the determination of anthropometric indices of preschool girls & boys aged 3-5 years from kindergarten (KG) and anganwadi (AW). Effect of energy and energy giving nutrients on anthropometric measurements was assessed. Total 300 girls and boys from age groups 3+, 4+ & 5+ years from well known KG and AW from Nagpur city were studied for a period of one year with two study periods-at the beginning (0 month) & at the end (12 months) of the year. Anthropometric indices like height, weight, mid upper arm & head circumference were measured using standard tools & procedures. Based on three day's dietary information, nutrient intake of subjects was calculated. Majority of subjects from KG were nutritionally fit owing to better food choices & nutrient intake as compared to subjects from AW. Subjects from KG (age groups 3+, 4+ & 5+ yrs) were taller & heavier than girls & boys from AW. Weight correlated positively with nutrient intake of energy of subjects.

Keywords: Anthropometric measurements, nutrient intake, dietary recall.

INTRODUCTION:

School going children are the future generation of the country and their nutritional needs are critical for the well being of the society. Good nutrition during school-age is critical to cover the deficits suffered during childhood (Sultan, S., 2014).

Diet is one of the prime determinants of health and nutritional status. An inadequate diet, poor in both quality and quantity has been one of the reasons for high levels of malnutrition in children. Young children need energy for deposition of tissues. Energy is also required for physical activity of daily life. Carbohydrates, fats and proteins in the food are the chief energy yielding nutrients. During the age of preschool, deficiencies of protein & /calorie in diet result in underweight, wasting, stunted growth, low immunity and also impaired cognitive and motor development and learning. In contrast, children from middle to higher income groups tend to consume higher amounts of energy, carbohydrate, protein & fat. Wrong food choices & higher consumption of energy can lead to childhood obesity & other health issues (Kulsum, A. et al., 2015).

Expenditure on food is a mirror image of a household's income and resources. If the household has limited purchasing power, not only may the per capita intake be less, but also the deficits are likely to be borne disproportionately by the children. This is

truer in developing countries. As a result, the nutritional status of children is likely to be more adversely affected than that of other members of the family with the decline of per capita expenditure on food.

Besides low economic status, increased family size may adversely affect the nutritional status of every member of the household, including preschool children, because it may be associated with decreased per capita human inputs. In other words, the allocation of food per child is likely to decrease with the increase in the number of children, which, in turn, may adversely affect the nutritional status of children. Increased household size also implies acceptance of lower quality/quantity models of fertility decision.

Low socio-economic status of the family, illiteracy & non working status of mothers & large family size are the contributory factors for inadequate consumption of energy and protein of preschool age children from low income group from rural as well as urban areas (Sultan, S., 2014). Intervention efforts started by Government aim at improving the nutritional status of children which includes schemes like anganwadis run under ICDS. Present research is an attempt to compare anthropometric indices & dietary intake of preschool age girls & boys from anganwadi (low income group) & kindergarten (middle income group)

METHODOLOGY:

Study Area and Sample Selection: For present study, total 300 girls & boys from age group 3-5 yrs were selected from well known kindergartens (KG) and anganwadis (AW) from Nagpur city. Subjects were studied for one year i.e. during 0 month (at the beginning of the study period) & 12 month (at the end of the study period). Table 1 shows age wise classification of girls & boys.

Anthropometric

Anthropometric measurements like height, weight, mid upper arm circumference (MUAC) & head circumference were measured using standard procedures and equipments. Skinfolds at triceps & subscapular were also measured with the help of skinfold caliper. Comparisons were done with reference standards for gender & age (National Nutrition Monitoring Bureau/NIN/ICMR, 2002 & Indian Nutrition Profile, 1998).

Nutrient Intake: Three day's dietary intake of subjects was collected using 24 hour's dietary recall method. Based on this, nutritive value (energy, carbohydrate, protein & fat) of diets of subject was calculated using standard food value tables (Gopalan et al., 2007). Nutrient intake of subjects was compared with recommended dietary allowances (RDAs) (National Institute of Nutrition (NIN)/Indian Council of Medical Research (ICMR), 2009).

Statistical Analysis: Data was collected and tabulated. Mean, standard deviation, minimum, maximum, and percentage values were calculated. Within age group comparisons at the beginning & at the end of the study period were done using correlated 't' test. Pearson's product moment coefficient of correlation was used to derive correlations. A level of significance at 5% & 1% was tested.

RESULTS AND DISCUSSION:

Tables 2 & 3 show data on anthropometric measurements of girls & boys, respectively. Irrespective of the gender, type of school & income level, significant annual increment in the mean values of height, weight, MUAC & head circumference was noted. However, higher correlated 't' values for KG subjects as compared to AW subjects indicate greater gain in these measurements during the period of one year.

Results clearly depict that girls & boys from KG (age groups 3+, 4+ & 5+ yrs) were taller & heavier than girls & boys from AW (age groups 3+, 4+ & 5+ yrs) at the end of 12 months. Girls & boys from KG (age groups 3+, 4+ & 5+ yrs) surpassed the standard reference

values of height & weight for age indicating influence of income level & nutritional habits on the measurements. In contrast, mean values of height & weight of girls & boys from AW (age groups 3+, 4+ & 5+ yrs) were found below the standard reference values of height & weight for age during 12 months. Height is genetically affected but also nutritionally influenced. Weight is a sensitive index for the evaluation of nutritional status of preschool children, particularly where their precise ages are known. Weight gain is said to be directly proportional to the dietary intake of energy & major nutrients.

Mean MUAC measurement values at the end of the study period for girls from KG (3+, 4+ & 5+ yrs) were found to be higher than the reference standards (Table 2). With the exception of girls aged 3+ yrs, girls aged 4+ & 5+ yrs from AW were also had mean MUAC during 12 months higher than the reference standards.

Younger girls (3+ yrs) from AW & KG had greater mean head circumference values as compared to the reference standard for age. In contrast to this, rest of the groups of age groups from both the schools had lower mean head circumference values as compared to the reference standard for age. These results indicate effect of age on the growth & development.

Skinfolds reflect body fat content. Tables 4 & 5 show data on mean triceps & subscapular skinfold measurements of girls & boys, respectively, taken during 0 & 12 months of the study period. Irrespective of the type of school & income level, girls aged 3+, 4+ & 5+ yrs showed significant annual increment in the measurement of triceps & subscapular skinfolds. However, KG subjects showed higher values of triceps & subscapular thicknesses. Subjects (girls & boys from AW & KG) from all age groups possessed higher mean triceps & subscapular skinfold thickness values as compared to the reference standards ($t=10.3$ to 89.9) indicating increased childhood subcutaneous fatness. Greater the skinfold thickness higher is the body fat content. Triceps & subscapular skinfolds depicted positive correlation with body weight among girls & boys from all age groups & both the schools ($r=0.0434$ to 0.3880 , Tables 8 & 9). Triceps skinfold showed positive correlation with energy intake whereas subscapular skinfold showed positive correlation with fat intake.

Girls & boys from KG (aged 4+ & 5+ yrs) showed excess mean energy intake in comparison with RDAs for age (Table 6). With the exception for girls aged 4+ yrs at 12 months, girls from rest of the age groups showed deficit mean intake of energy as compared to RDAs. Similar observations were noted for boys from AW from all age groups (Table 7).

Mean carbohydrate, protein & fat intake of subjects from KG was found to be higher than subjects from AW. Mean protein intake of girls & boys (3+, 4+ & 5+ yrs) from AW & KG was found to be more than RDAs, however, intake by AW subjects was found to be less than subjects from KG. Excessive consumption of concentrated sources of milk & milk products like cheese, paneer, chocolates was found to be more prevalent among subjects.

During a period of one year, there found significant rise in the values of mean intake of all three major energy yielding nutrients for both-girls & boys from AW & KG (t=6.77 to 17.9 for carbohydrate; t=4.7 to 22.4 for protein & t=3.93 to 24.5 for fat). Similarly, greater values for correlated 't' tests for comparison between energy intake during 0 & 12 months indicate highly significant increment in energy intake at the end of the study period (t=7.86 to 22.7). Energy intake reflected positive relationship with body weight (r=0.0114 to 0.5449).

Good nutritional status of children under this study is reflected by food purchasing power and consumption pattern of the family. People living below poverty line had poor purchasing power which affected the nutritional status of children.

Table 1: Age Wise Classification of Sample

Sr. No.	Age Group (years)	Subjects (N = 300)			
		Girls (n=150)		Boys (n=150)	
		KG	AW	KG	AW
1	3+	25	25	25	25
2	4+	25	25	25	25
3	5+	25	25	25	25

Parameters	Girls (Age in years)											
	KG						AW					
	3+		4+		5+		3+		4+		5+	
	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month
Height (cm)												
Mean	90.5 4	101.8 4	96.6 7	105.6 4	100.5 9	111.3 8	88.4 1	96.3 7	89.9 6	99.9 8	96.6 6	107. 4
SD	5.75	4.40	3.50	2.83	3.50	2.39	5.68	5.75	13.9 2	5.66	14.1 0	2.39
Minimum	81	94	90	98	94	104	79	85	0.96	89	0.92	100
Maximum	103	110	105	109	109	116	101	107	103	111	105	112
Std	98.2		105.1		111		98.2		105.1		111	
%E/D	-7.8	+3.71	-8.0	+9.63	-9.37	+0.34	-9.9	- 1.86	- 14.4	-4.87	- 12.9	- 3.24
t Values	17.2*		37.1*		39.1*		33.1*		40.6*		39.6*	
Weight (kg)												
Mean	13.6 3	16.56	15.8 8	17.54	16.55	18.08	11.9 1	13.8 9	13.1 1	14.4 3	15.8 8	17.5 7
SD	2.74	1.55	2.66	1.56	2.71	1.22	1.97	1.99	2.60	1.82	2.65	1.28
Minimum	10	14.50	14	15	14.70	16.10	8	10	0.99	11	0.98	15.7
Maximum	17.5 0	20.50	20.5 0	22	20.8	21.2	15.5	17.5	17.5	18.2	20.5	20.9

Std	14.4		16		17.7		14.4		16		17.7	
%E/D	-5.34	+15	-0.75	+9.62	-6.49	+2.14	17.2 9	-3.54	-18	-9.8	-10.3	-0.7
t Values	9.03*		24.1*		20.0*		99.0*		25.0*		23.1*	
MUAC (cm)												
Mean	12.7 2	15.36	14.0 6	15.38	14.43	15.38	11.7 4	12.7 1	12.7 3	13.6 5	14.0 6	15.1 4
SD	2.71	2.23	3	2.52	3.02	2.33	0.94	0.96	2.66	2.11	2.99	2.33
Minimum	10	12	12	13	12.30	12.80	10	10.5	0.99	10.4	0.99	12.6
Maximum	20	20.50	20	22	20.40	21	13	14	20	20.7	20	20.8
Std	13.4		13.6		14.0		13.4		13.6		14.0	
%E/D	-5.0	+14.6 2	+3.3	+13.0 8	+3.07	+9.8	-12.3	-5.14	-6.3	+0.3 6	+0.4 2	+8.1 4
t Values	9.72*		31.2*		27.6*		66.8*		67.7*		46.0*	
Head Circumference (cm)												
Mean	46.0 1	48.35	46.6 5	48.17	46.81	48.11	46.9 4	48.3 5	46.01	47.3 2	46.65	47.9
SD	6.67	1.16	6.64	1.30	1.27	1.26	1.62	1.15	6.62	1.61	6.63	1.26
Minimum	44	45	45	45.50	45.10	45.60	44	45	0.99	44.3	0.99	45.3
Maximum	50	50.60	50	50.50	50.20	50.60	50	50.6	50	50.4	50	50.4
Std	48.9		49.61		49.92		48.9		49.61		49.92	
%E/D	-5.9	-1.12	-5.9	-2.9	-6.2	-3.6	-4.0	-1.1	-7.2	-4.6	-6.5	-4.0
t Values	8.51*		22.9*		32.3*		8.28*		14.9*		45.1*	

SD-Standard Deviation; Std-Standard; %E/D-%Excess/Deficit; 't' values are for correlated 't' test; * - Significant at both 5 % and 1% levels.

Table 3: Data on Anthropometric Measurements of Boys

Parameters	Boys (Age in years)											
	KG						AW					
	3+		4+		5+		3+		4+		5+	
	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month
Height (cm)												
Mean	93.3 7	100.8 6	100	106.7 8	103.7 1	114.4 8	91.4 1	97.1 1	93.9 6	99.2 4	98.0 9	110.5
SD	5.22	4.86	3.77	2.38	3.16	2.17	13.9 1	4.03	14.2 5	4.50	14.3 8	2.16
Minimum	87	93	95	103	99	110	0.97	91	0.97	92	0.83	106
Maximum	106	110	108	113	109	117	104	105	107	109	108	113
Std	99.1		105.7		111.5		99.1		105.7		111.5	
%E/D	-5.7	+1.78	-5.39	+1.02	-6.9	+2.67	-7.7	-2.0	-11.1	-6.11	-12.0 2	-0.91
t Values	18.7*		25.8*		53.4*		18.2*		19.4*		32.3*	
Weight (kg)												
Mean	15.5	16.93	16.2	17.90	17.16	18.84	15.9	18.3	16.1	17.5	15.9	18.3

SD	1.03	0.93	0.79	0.79	0.75	0.77	2.28	0.60	2.47	1.16	2.28	0.60
Minimum	14	15.10	15.50	17	16	18	0.93	17.4	0.98	15	0.93	17.4
Maximum	18	19	18	19	18.55	20	18	19.6	19	20	18	19.6
Std	14.8		16.5		18.2		14.8		16.5		18.2	
%E/D	+4.79	+14.39	-1.39	+8.49	-5.71	+3.52	+7.9	+23.6	-2.4	+6.18	-12.2	+0.55
t [†] Values	38.5*		31.0*		26.6*		27.2*		38.1*		46.6*	
MUAC (cm)												
Mean	12.73	13.39	13.29	14.31	13.90	15.32	13.05	14.65	12.73	13.89	13.05	14.65
SD	2.03	1.98	0.94	0.95	0.90	0.96	1.95	0.96	2.61	1.97	1.95	0.96
Minimum	10	10.90	12	13	12.60	14	0.98	13.2	0.99	10.9	0.98	13.2
Maximum	16	17	14	15	14.70	16	14	15.7	16	17	14	15.7
Std	13.6		13.8		13.9		13.6		13.8		13.9	
%E/D	-6.3	-1.5	-3.6	+3.6	-	+10.2	-4.0	+7.7	-7.7	+0.6	-6.1	+5.3
t [†] Values	78.4*		72.9*		76.7*		52.9*		78.4*		64.2*	
Head Circumference (cm)												
Mean	47.94	49.59	48.70	49.70	49.16	50.70	47.76	49.93	47.94	45.59	47.76	49.93
SD	1.42	1.37	1.04	1.04	0.91	1.04	6.75	1.04	6.85	1.37	6.75	1.04
Minimum	44	44.80	47	48	47.50	49	0.99	48.2	0.99	44.80	0.99	48.2
Maximum	50	50.80	50	51	50.30	52	50	51.3	50	50.8	50	51.3
Std	49.82		50.45		50.73		49.82		50.45		50.73	
%E/D	-3.7	-0.4	-3.4	-1.4	-3.0	-0.0	-4.1	+0.2	-4.9	-9.6	-5.8	-1.5
t [†] Values	48.7*		12.22*		67.9*		31.5*		48.7*		157.7*	

SD-Standard Deviation; Std-Standard; %E/D-%Excess/Deficit; t[†] values are for correlated t[†] test; * - Significant at both 5 % and 1% levels.

Table 4: Data on Skinfold Measurements of Girls

Parameters	Girls (Age in years)											
	KG						AW					
	3+		4+		5+		3+		4+		5+	
	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month	0 Month	12 Month
Triceps Skinfold (mm)												
Mean	11.39	13.30	12.24	13.05	12.68	13.81	11.04	11.72	11.39	12.28	12.02	13.57
SD	1.51	1.36	1.74	1.76	1.75	1.74	1.00	1.01	2.10	1.45	2.33	1.73
Minimum	10	11	10	10.60	10.20	11.20	10	10.3	0.99	10.7	0.98	10.9
Maximum	16	17	16	16.90	16.40	17.10	12	13	16	16.3	16	16.9
Std	8.38		8.67		8.82		8.38		8.67		8.82	
%E/D	+35.9	+58.7	+41.1	+50.5	+43.7	+56.5	+31.7	+39.8	31.3	+41.6	+36.2	+53.8
t [†] Values	10.3*		63.7*		33.2*		36.5*		35.2*		34.4*	
Subscapular Skinfold (mm)												
Mean	10.12	11.74	11.12	11.77	11.35	12.15	9.72	10.43	9.92	12.77	10.92	11.92
SD	1.17	0.84	1.15	1.16	1.12	1.19	0.92	0.88	1.82	14.21	1.82	1.16

Minimum	6	10	10	10.5	10.10	10.80	6	7	0.05	7.2	0.99	10.7
Maximum	12	14	14	14.6	14.10	15.30	10	12.7	12	12.7	14	14.9
Std	6.06		6.07		6.08		6.06		6.07		6.08	
%E/D	+66.9	+93.7	+83.1	+93.9	+86.6	+99.8	+60.3	+72.1	+63.4	+110.3	+79.6	+96
't' Values	11.2*		28.6*		31.2		13.9*		20.5*		54.2*	

SD-Standard Deviation; Std-Standard; %E/D-%Excess/Deficit; 't' values are for correlated 't' test; * - Significant at both 5 % and 1% levels.

Table 5: Data on Skinfold Measurements of Boys

Parameter	Boys (Age in years)											
	KG						AW					
	3+		4+		5+		3+		4+		5+	
	0	12	0	12	0	12	0	12	0	12	0	12
	Mo	nth	Mo	nth	Mo	nth	Mo	nth	Mo	nth	Mo	nth
Triceps Skinfold (mm)												
Mean	11.62	12.44	10.72	13.72	11.35	12.73	10.06	10.67	11.41	12.44	10.53	12.26
SD	2.13	2.12	1.05	14.08	1.08	1.07	1.50	0.77	2.57	2.11	1.71	1.07
Minimum	8	8.90	10	11	10.30	11	0.99	8.5	0.9	8.9	0.99	10.9
Maximum	16	16.80	14	15	14.70	16.10	12	12.5	16	16.8	14	15.6
Std	7.78		7.65		7.57		7.78		7.65		7.57	
%E/D	+49.3	+59.8	+40.1	+79.3	+49.9	+68.1	+29.3	+37.1	+49.1	+62.6	+39.1	+61.9
't' Values	80.4*		82.22*		47.5*		49.0*		80.4*		89.9*	
Subscapular Skinfold (mm)												
Mean	10.72	11.43	11.12	12.12	11.26	12.65	9.39	9.88	10.53	11.43	10.92	12.17
SD	1.84	1.84	1.22	1.22	1.20	1.15	1.45	0.82	2.27	1.84	1.86	1.15
Minimum	8	8.50	10	11	10.10	11.20	0.99	8.3	0.9	8.5	0.97	10.7
Maximum	14	14.8	14	15	14.10	15.70	10	10.4	14	14.8	14	15.2
Std	5.65		5.45		5.36		5.65		5.45		5.36	
%E/D	+89.7	+102.3	+104	+122.3	+110	+136	+66.1	+74.8	+93.2	+109.7	+103.7	+127
't' Values	58.9*		18.88*		33.3*		56.0*		58.9*		27.0*	

SD-Standard Deviation; Std-Standard; %E/D-%Excess/Deficit; 't' values are for correlated 't' test; * - Significant at both 5 % and 1% levels.

Table 6: Data on Daily Intake of Energy & Energy Giving Nutrients for Girls

Parameter	Girls (Age in years)											
	KG						AW					
	3+		4+		5+		3+		4+		5+	
	0	12	0	12	0	12	0	12	0	12	0	12
	Mo	nth	Mo	nth	Mo	nth	Mo	nth	Mo	nth	Mo	nth

Energy (kcal)												
Mean	1006	1459	1380	1520	1476	1523	763	966	1005	1259	995	1149
SD	142.16	115.75	101.24	124.29	114.9	110.2	97.5	101.38	143.08	108.43	130	111.4
Minimum	725	1108	1224	1329	1220	1346	520	725	725	1021	725	933
Maximum	1269	1698	1624	1990	1701	1776	928	1166	1315	1441	1235	1336
Std	1140		1192		1277		1140		1192		1277	
%E/D	-11.75	+27.8	+15.77	+27.5	+15.58	+19.26	-33.07	-15.35	-15.6	+5.62	-22.16	-10.1
t Values	19.2*		7.86*		11.9*		9.16*		18.6*		22.7*	
Carbohydrate (g)												
Mean	1407	20959	176.84	193.27	186.94	195.07	110.48	137.67	140.48	164.61	140.51	154.55
SD	29.48	22.52	31.83	17.87	32.35	17.97	20.27	18.37	29.89	19.86	29.91	20.38
Minimum	100	145	145	167.8	154	169.3	95.6	100	100	125	100	123
Maximum	1803	2543	223	235	235.6	238.4	139.23	175.2	185.2	198	185.2	185
t Values	14.9*		12.7*		6.77*		7.72*		11.4*		14.6*	
Protein (g)												
Mean	40.28	49.51	53.6	59.1	56.42	59.24	25.82	35.97	35.62	44.40	37.13	44.49
SD	13.70	3.09	8.30	3.64	8.75	3.57	6.77	7.55	8.84	7.17	10.86	6.00
Minimum	66	55.2	60	65.4	64.5	65	40.19	57.8	59.7	58.2	59.7	55.2
Maximum	20.27	41.2	50	51.2	50	52	19.5	20.27	20.27	20.27	20.27	31
Std	16.8		17.8		19.3		16.8		17.8		19.3	
%E/D	+139.7	+194.7	+201.1	+232	+192.3	+206.9	+53.69	+114.1	+100.1	+149.4	+92.4	+131
t Values	4.7*		14.8*		7.2*		7.93*		16.1*		7.14*	
Fat (g)												
Mean	29.96	47.60	48.01	56.91	53.12	56.48	25.6	30.6	30	47.6	30	39.4
SD	5.42	3.08	7.90	4.17	9.03	4.42	4.7	3.34	5.48	3.08	5.39	5.23
Minimum	24.2	40.1	40	45.6	40	45.8	20.5	24.2	24.2	40.1	24.2	30

m												
Maximum	38.2	53.6	60	63.4	62.6	64	30.5	38.2	38.2	53.6	38.2	49.8
't' Values	24.5*		12.9*		8.12*		6.91*		23.8*		14.3	

SD-Standard Deviation; Std-Standard; %E/D-%Excess/Deficit; 't' values are for correlated 't' test; * - Significant at both 5 % and 1% levels.

Table 7: Data on Daily Intake of Energy & Energy Giving Nutrients for Boys

Parameters	Boys (Age in years)											
	KG						AW					
	3+		4+		5+		3+		4+		5+	
	0 Mo nth	12 Mo nth	0 Mo nth	12 Mo nth	0 Mo nth	12 Mo nth	0 Mo nth	12 Mo nth	0 Mo nth	12 Mo nth	0 Mo nth	12 Mo nth
Energy (kcal)												
Mean	1034	1306	1421	1606	1513	1541	794	996	1022	1142	1021	1077
SD	146.34	170.94	99.55	94.10	105.67	100.52	92.47	78.73	139.47	115.93	128.77	123.99
Minimum	755	921	1113	1418	1337	1345	636	795	755	890	664	830
Maximum	1357	1638	1611	1843	1729	1760	982	1220	1290	1358	1273	1345
Std	1217		1283		1375		1217		1283		1375	
%E/D	-15.03	+7.31	+10.7	+25.1	+10	+12.07	-34.75	-18.15	-20.34	-11.06	-25.74	-21.6
't' Values	14.0*		8.16*		12.2*		20.8*		12.2*		7.91*	
Carbohydrate (g)												
Mean	143.97	183.24	188.72	215.84	190.21	195.9	111.18	139.22	143.62	156.67	144.83	151.39
SD	30.09	30.01	32.82	18.94	32.15	18.01	20.28	11.53	29.86	21.02	30.00	21.27
Minimum	108.3	123	146.5	180	169.3	170	95.6	108.3	108.3	123	109.2	110
Maximum	189.5	243	240	255	232	240	139.23	165.7	189.5	198.6	190.4	190
't' Values	9.63*		8.76*		6.55*		17.9*		7.91*		7.68*	
Protein (g)												
Mean	41.57	48.15	50.70	58.47	57.81	60.03	25.90	34.18	37.66	43.05	37.41	40.70
SD	14.11	7.33	7.74	3.72	8.90	3.78	6.69	6.50	10.71	7.31	9.57	8.18
Minimum	20.3	32	45	50	51.2	55	19.5	25	20.3	30	22.3	25
Maximum	67.3	64	55.6	65.4	65.4	66.5	40.19	50	61.5	55.6	59.3	60

um												
Std	17.2		18.3		19.8		17.2		18.3		19.8	
%E/D	+1 41 .6	+1 79 .9	+17 7	+21 9.5	+191. 6	+2 03 .1	+50.58	+98.7	+105.7	+135.2	+88.9 3	+105.5
t' Values	4.49*		13.0*		5.51*		22.4*		7.01*		9.61*	
Fat (g)												
Mean	31 .2	42 .7	48. 7	57. 1	55.2	57 .5	25.8	33.7	31.1	38.1	31.2	34.2
SD	5. 6	5. 7	7.5	3.5	8.9	3. 37	4.6	3.3	5.5	4.4	5.5	4.9
Minimum	24 .5	30	45	50	45	45	20.5	26.5	24.5	30	24.5	25
Maximum	39 .5	53 .7	55	63	63	65	30.5	40	39.5	47.3	39.5	49.9
t' Values	17.3*		15.1*		3.93*		14.8*		13.9*		5.95*	

SD-Standard Deviation; Std-Standard; %E/D-%Excess/Deficit; t' values are for correlated t' test; * - Significant at both 5 % and 1% levels.

**Table 8: Correlation of Coefficient values for Girls
r Values for Girls (Age in Yrs)**

Parameters	r Values for Girls (Age in Yrs)					
	3+		4+		5+	
	KG	AW	KG	AW	KG	AW
Weight vs. Hip Circumference	0.0224	0.3025	-0.1143	0.2935	-0.1310	-0.1346
Weight vs. MUAC	-0.1119	0.1853	-0.2350	0.3799	-0.2065	-0.1982
Weight vs. Triceps	0.1246	0.0434	0.1572	0.3648	0.2564	0.2344
Weight vs. Subscapular	0.0955	0.1421	0.3880	-0.0860	0.3501	0.3239
Weight vs. Energy Intake	0.1306	0.1796	0.0767	0.1235	0.1799	0.1345
Weight vs. Carbohydrate Intake	-0.1781	0.1014	-0.1025	0.1056	-0.0823	0.2217
Weight vs. Protein Intake	-0.0666	0.1901	-0.0721	0.1761	-0.1778	0.0589
Weight vs. Fat Intake	0.0575	0.1537	0.0858	-0.0030	-0.2116	-0.1033
Triceps vs. Energy Intake	0.2313	0.0750	0.1102	0.0641	0.0099	0.1150
Triceps vs. Carbohydrate Intake	-0.2887	-0.0184	0.0214	-0.0820	0.0107	0.2063
Triceps vs. Protein Intake	-0.3025	-0.1347	-0.1952	-0.0434	-0.1496	0.0949
Triceps vs. Fat Intake	0.1097	-0.0518	0.2580	-0.0028	0.0646	-0.1507
Subscapular vs. Energy Intake	-0.0540	0.0783	-0.0859	0.1247	-0.1618	0.1075
Subscapular vs. Carbohydrate Intake	-0.0400	0.1436	-0.0872	0.1812	-0.0992	0.2361
Subscapular vs. protein Intake	-0.1282	-0.0800	-0.2534	-0.0783	-0.2400	0.0898
Subscapular vs. Fat Intake	0.0031	0.0351	0.0560	0.2778	0.1420	0.2218

Table 9: Correlation of Coefficient values for Boys

Parameters	r Values for Boys (Age in Yrs)					
	3+		4+		5+	
	KG	AW	KG	AW	KG	AW
Weight vs. Hip Circumference	0.3842	0.4037	-0.0124	0.2473	-0.0115	0.0016
Weight vs. MUAC	-0.0810	0.3658	-0.1480	0.2108	0.0125	0.0359
Weight vs. Triceps	0.3874	0.1246	0.1903	0.2747	0.1507	0.1526
Weight vs. Subscapular	0.1336	0.4383	0.3468	0.1355	0.1763	0.2547
Weight vs. Energy Intake	0.3625	0.5449	0.0143	0.0114	0.1429	0.1003
Weight vs. Carbohydrate Intake	-0.3916	-0.5101	0.1118	-0.0324	-0.1267	0.0143
Weight vs. Protein Intake	-0.0987	-0.3370	-0.0376	-0.1422	0.0533	0.0547
Weight vs. Fat Intake	-0.2617	-0.3670	-0.1069	0.2100	-0.1926	0.2042
Triceps vs. Energy Intake	0.0895	0.3666	0.0615	0.1410	0.1771	0.1908
Triceps vs. Carbohydrate Intake	-0.1548	-0.1196	-0.0030	0.1385	0.1478	-0.0772
Triceps vs. Protein Intake	0.0331	-0.4801	0.0558	-0.0800	-0.0877	-0.2276
Triceps vs. Fat Intake	0.0280	-0.3684	0.2047	0.2874	0.2662	-0.2151
Subscapular vs. Energy Intake	0.2409	0.3134	-0.0464	0.2642	-0.0452	0.0152
Subscapular vs. Carbohydrate Intake	0.1808	0.3850	-0.0567	0.1762	-0.0456	0.1202
Subscapular vs. protein Intake	0.1112	-0.0204	0.0768	0.1719	-0.1222	-0.2931
Subscapular vs. Fat Intake	0.3280	0.2339	0.0101	0.3437	0.0426	0.0273

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