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ENERGY INTAKE, ENERGY EXPENDITURE & ANTHROPOMETRIC STATUS OF THE ADOLESCENTS

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Abstract: Adolescence, one of the nutritional stress periods of life with profound growth, comes with increased demands for energy, protein, minerals and vitamins.Total energy expenditure was computed by adding the full energy expenditure for all activities with energy expenditure for growth. Anthropometric measurements can be used to monitor changes in growth of adolescents. Research on anthropometric measurements of adolescents is an important determinant of a nation's health. Measurements of height, weight and nutrient intake are the reliable means to evaluate the nutritional status and it is very much in need. Therefore this study suggests that the energy intake of large sample size and energy expenditure, anthropometric by them should further be done for coming to a conclusion.
Keywords: Adolescents, Energy Intake, Energy expenditure, Anthropometric measurement.

Introduction

Adolescence is a vulnerable period in human lifecycle when nutritional requirements increase due to the adolescent growth spurt. This period is characterized by rapid increase in height, weight and hormonal changes resulting in sexual maturation (Gupta 1990). Adolescence, one of the nutritional stress periods of life with profound growth, comes with increased demands for energy, protein, minerals and vitamins (Gopalan *et al*. 2001)

Physical activity is another major lifestyle related health determinants. However such an important health protecting behaviour is seen to decline during adolescence. The WHO recommends that children and young people aged 5 to 17 years old should accumulate at least 1hour of moderate to vigorous intensity physical activity per day. Older girls spent most of their leisure time by watching TV, sewing and gossiping. Leisure activities of younger girls and boys are mainly games. Total energy expenditure was computed by adding the full energy expenditure for all activities with energy expenditure for growth. This value was compared with the standard total daily energy expenditure as per WHO guidelines. Anthropometric measurements can be used to monitor changes in growth of adolescents.

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Research on anthropometric measurements of adolescents is an important determinant of a nation's health. Measurements of height, weight and nutrient intake are the reliable means to evaluate the nutritional status and it is very much in need. The purpose of this study was to conduct the energy expenditure anthropometric measurements and to explore the nutrient intake of the selected adolescent in Pusa block in Samastipur district.

Material & Method

Two private and Two Government Schools of Samastipur district of Bihar were selected. A sample of 120 adolescent students (60 each from private and government schools) aged between 13 to16 years were selected by purposive sampling method. General information regarding caste, religion, family size, and types of family as well as their socio-economic status was obtained from each subject. To measure the energy intake, energy expenditure and anthropometric questionnaire was developed. Direct interview method was adopted to collect relevant information from the respondent. The data have been represented in mean, SD and t-test table.

General information about the subjects has been presented in Table 1. This table inferred that majority of the adolescent i.e., 41.6 percent and 38.4 percent from government and private school were of the age of 14 years followed by 33.4 percent and 26.6 percent of 15 years age group adolescent of government and private school. The table 1 further showed that 20 and 30 percent of adolescent from government and private school were of 13 years and 5 percent were of 16 years.

Table 1 also showed that 50 percent of adolescents were from both the government and private school studying in VIIIth and IXth class.

Table 1 further revealed that majority of the adolescents i.e., 63.3 percent from government school and 66.6 percent from private school were non-vegetarian followed by 16.6 percent and 30 percent lacto-vegetarian from government and private school. The vegetarian from government school constitute 18.3 percent and from private school 1.6 percent. The Ovo-vegetarian both from government and private school constitute 1.6 percent.

Table No. 1. General information of the subjects

Particulars	**Government school students (60)**		**Private school students (60)**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
A. Age(years)				
13	12	20	18	30

14	25	41.6	23	38.4
15	20	33.4	16	26.6
16	3	5.0	3	5.0
B. Education				
8^{th}	30	50	30	50
9^{th}	30	50	30	50
C. Food habits				
Vegetarian	11	18.3	1	1.6
Non-vegetarian	38	63.3	40	66.6
Ovo-vegetarian	1	1.6	1	1.6
Lacto-vegetarian	10	16.6	18	30

Result and Discussion

Table 2. Anthropometric measurements of subjects

Particular	**Government school students (60)**		**Private school students (60)**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
A. Height(cm)				
133-145	1	1.6	-	-
145-151	26	43.3	28	46
152-158	32	53.3	32	53.3
159-165	1	1.6	-	-
B. Weight(kg)				
30-40	21	35	22	36.6
40-50	36	60	33	55
50-60	3	5	5	8.3
C. BMI(kg/m^2)				
15-<18	17	28.3	20	33.3
18-<21	37	61.6	29	48.3
21-<24	6	10	11	18.3

Height

Table 2 inferred that 53.3 percent of subjects both from government and private school falls in the category of (152-158) cm, followed by 43.3 percent subjects from government school

and 46 percent subjects from private school in the region of (145-151) cm and 1.6 percent subjects from government school falls in the region of (159-165) cm and (133-145) cm. Table 2 inferred that the height of government school adolescent were less compared to the height of private school subjects. This may be attributed due to the fact that government school subjects have poor nutritional intake than the private school subjects.

Weight

In relation to weight 35 and 36.6 percent of subjects from government and private school fall in between (30-40) kg, followed by 60 & 55 percent of the subjects from government and private school in the range of (40-50) kg and 5 & 8.3 percent of subjects from government and private school fell in between (50-60) kg. The weight of both government and private school adolescent were approximately same.

BMI

BMI is the parameter to denote a person of ideal weight, over weight and obese. It observed from the table that 61.6 and 48.3 percent of subjects from government and private school were having BMI 18- < 21,28.3 and 33.3 percent of subjects from government and private school were in the range of 15- < 18 and 10 and 18.3 percent of subjects from government and private school were in the range of 21- < 24. This inferred that the private school adolescent had lower BMI compared to the government school adolescent. This reason may be because the government school adolescent would have eaten more green leafy vegetable, cereals and pulses than private school adolescents, because of their economic condition but as the family income increases, the tendency towards eating green leafy vegetable by the adolescent specially decreases & other costly items increases, including junk foods.

Table 3. Nutrient intake by Subjects

Particulars	**Government school (60)**	**Private school(60)**	
	Mean±SD	**Mean±SD**	**RDA* (ICMR)**
Energy(kcal)	1571.47±235.71	1605.45±227.57	2302
Protein(gm)	43.5±7.99	45.17±9.8	69
Fat(gm)	42.39±12.5	46.79±10.16	22
Iron (mg)	28.9±9.51	30.40±6.94	37
Calcium (mg)	340.72±116.13	369.04±112.68	550

* Recommended Dietary Allowances (ICMR, Gopalan *et al*. 1989)

Table 3 represents the Nutrients intake of subjects between government & private school

Energy (Kcal)

As compared to R.D.A value of energy (2302kcal), the calorie intake by the subjects of government school were (1571.47±235.71 Kcal) and private school subjects were (1605.45±227.57 kcal).

Protein (g)

As compared to R.D.A value of energy (69g), the protein intake by the subjects of the government school was (43.55±7.99 g) and by private school was (45.17±9.8 g).

Fat (g)

As compared to R.D.A value of fat (22g), the fat intake by the subjects of the government school was (42.39±12.5g) and private school was (46.79±10.16 g).

Iron (mg)

As compared to R.D.A value of iron (37mg), the iron intake by the subjects of the government school was (28.9±9.51mg) and private school was (30.40±6.94 mg).

Calcium (mg)

As compared to R.D.A value of calcium (550mg), the calcium intake by subjects of the government school was (340.72±116.13 mg) and private school was (369.04±112.68 mg).

Table 4. Energy expenditure in physical activity by the subjects

Particulars	**Government school (60)**			**Private school(60)**		
	Mean±SD	**Max.**	**Min.**	**Mean±SD**	**Max.**	**Min.**
Energy Expenditure (kcal)	639.55±282.75	1355.8	175.1	535.08±242.99	1207.2	87

Table 4 showed that the energy expenditure mean±sd of government school adolescents were more than that of the private school adolescents. The government school subject's energy expenditure was 639.55±282.75 where as the private school subjects were 535.08±242.99.

Table 5. Difference between energy expenditure in physical activity by subjects

Particulars	Mean±SD (govt.)	Mean±SD (pvt.)	Difference(t-test)
Energy Expenditure(kcal)	639.55±282.75	535.08±242.99	2.17*

*. Correlation is significant at the 0.05 level.

T-test was computed for the energy expenditure of government and private school adolescents. The differences were found significant. The government school adolescents were expending more energy than the private school adolescent. This may be due to the reason that private schools adolescent were doing more sedentary work than the government school adolescent. The private school adolescent were giving more time in watching T.V., using

networking sites and in their study while government school adolescent were giving more time in physical activities and domestic work. This finding was supported by Ogcchi U.P (2012).

6. Correlation Coefficient between nutrient intake and anthropometric parameters.

Table 6 inferred that the correlation coefficient between energy intake and government school adolescent weight (r = 0.280) was positive and significant at 5 percent level of significance and with BMI (r = 0.380) was positive and highly significant at 1 percent level of significance while height was non-significance. The correlation coefficient between energy and private school adolescent weight (r = 0.368) was positive and highly significant at 1 percent level of significance and with BMI (r = 0.333) was positive and highly significant at 1 percent level of significance while height was non-significance.

A Positive & Significant correlation between protein intake & body weight, BMI was found but no relation with height of students was observed.

Table 6 also depicted that the correlation coefficient between fat and government school adolescent BMI (r = 0.311) was positive and significant at 5 percent level of significance while with height and weight was not-significant. The correlation coefficient between fat and private school adolescent's height, weight and BMI was non-significance.

Table 6 also depicted that the correlation coefficient between iron and height, weight and BMI of government school adolescent was not significant. The correlation coefficient between iron and weight (r = 0.448) and BMI (r = 0.421) of private school adolescent was positive and highly significant at 1 percent level of significance while with height was not significant.

Table 6 further showed that the correlation coefficient between calcium and weight (r = 0.420) and BMI (r = 0.332) of government school adolescent was positive and highly significant at 1 percent level of significance while with height was not significant. The correlation coefficient between calcium and weight (r = 0.324) and BMI (r = 0.301) of private school adolescent was positive and significant at 5 percent level of significance while with height was not significant.

The findings were supported by Kumari M.R. *et. al*., (2014), Goyal R. and Julka S. (2014), Miah S. *et.al*., (2014), Odo F.I. *et.al*.,(2015).

Table 6. Correlation Coefficient between nutrient intake and anthropometric parameters

	Government			Private		
	Height	**Weight**	**BMI**	**Height**	**Weight**	**BMI**
Energy(Kcal)	-0.071	0.280*	0.380**	0.143	0.368**	0.333**
Protein(g)	0.178	0.297*	0.251	0.173	0.542**	0.500**
Fat(g)	-0.032	0.251	0.311*	0.108	0.059	0.008
Iron(mg)	0.150	0.144	0.111	0.161	0.448**	0.421**
Calcium(mg)	0.226	0.420**	0.332**	0.062	0.324*	0.301*

Conclusion

Physical activity is major lifestyle related health determinants. However such an important health protecting behaviour is seen to decline during adolescence. Anthropometric measurements can be used to monitor changes in growth of adolescents. Research on anthropometric measurements of adolescents is an important determinant of a nation's health. Measurements of height, weight and nutrient intake are the reliable means to evaluate the nutritional status and it is very much in need.

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