



Screening of adolescent girls for nutritional status as per food habit

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Abstract:

The present study was undertaken to screen the nutritional status of selected adolescent girl as per food habit. Purposively 600 adolescent girl i.e.300 each from urban and rural area of Parbhani district of Maharashtra state was covered. Nutritional status was assessed by using anthropometric measurements viz. measurements of height (cm), weight (kg), mid- upper arm circumference (cm), waist- hip ratio and recorded measurements were compared with NCHS (1977) reference values. BMI was calculated using value of height and weight. Food intake was assessed by using 24 hours recall method for three consecutive days. Quantity of food stuff consumed by each subject was calculated by weightment method. By using food composition table of ICMR nutrient intake was calculated. Further food intake was compared with balanced diet and nutrient intake was compared with the (RDA) recommended dietary allowances for calculating the percent adequacy. The finding of study revealed that the influence of food habit as anthropometric measurement of adolescent girls no specific effect was noted in urban and rural girls with respect to height and weight. Significant difference was observed only for MUAC of urban girls. More percentage of vegetarian girls was normal and overweight also while non vegetarian girls were suffered from one or more degree of under nutrition. Mean food intake of cereals, pulses, roots and tubers, other vegetables, condiment and spices, sugar and jaggery were found to be more among non-vegetarian adolescent contrary intake of green leafy vegetable, nuts and oilseed, fruits, milk and milk products, fats and oils was recorded more among vegetarian girls. The similar trend was noted for percent adequacy of food intake for both food habits. But the consumption of food intake was below the ICMR recommendation. Significant difference was noted for intake of energy, β - carotene, riboflavin, niacin, vitamin C and zinc. However nutrient intake was found to be lower than Recommended Dietary Allowances except for fat, folic acid and vitamin C. High per cent adequacy was observed for fat followed folic acid and niacin whereas lowest per cent adequacy noted for β -carotene and calcium Per cent adequacy for other nutrient intake was more than 59 per cent among the adolescent girls belonging to both groups.

Introduction:

Adolescents are full of energy having a significance drive and new ideas. They are a positive force for a nation and are responsible for its future productivity. Adolescence a period of transition between childhood and adulthood, occupies a crucial position in the life of human beings. This period is an important physiological phase of life characterized by an exceptionally rapid rate of growth and development both physical and psychological. During adolescence 20 per cent of final adult height and 50 per cent of adult weight are attained, bone mass increases of 45 per cent and dramatic bone remodelling occur, soft tissues, organs and even red blood cell mass increases in size. Nearly every organ in the body grow faster during this period which last about three years. Growth of adolescent can be assessed by anthropometric measurements i.e. by height, weight, mid upper arm circumference, hip: waist ratio and Body Mass Index is a widely used parameter and it is moderately associated with height among adolescents. BMI reflects the positive association between height and weight.

Good nutrition promotes the production and activities of growth hormones, which influences the metabolism of proteins, carbohydrates, fat, mineral and promotes nitrogen retention. Biologists and nutritionists have charted the effect of nutritional deficiencies on the human growth profile. Fatal malnutrition, especially when combined with poor nutrition during infancy and early childhood, may lead to substantial permanent stunting, even if nutrition improves at later ages. Short periods of under nutrition during adolescence merely delay the adolescent growth spurt. A lack of adequate nutrition hinders such natural pattern and causes stunted physical growth accompanied by physiological abnormalities or even retarded mental development. If under nutrition is prolonged, moderate growth will continue beyond the age at which the growth of well-fed adolescents ceases. Hence, average size at birth, the average age at which growth spurt peaks, the average age at which growth terminates, the mean height during adolescent ages and the mean final height are all indicators of mean nutritional status.

Anthropometry is influenced by nutrition particularly in the rapidly growing period of adolescence. Selected body measurement can therefore give valuable information concerning certain types of Malnutrition (Jelliffe 1966). Malnutrition (under nutrition or over nutrition) which refers to an impairment of health either from a deficiency or excess imbalance of nutrient is of public health significance among adolescent all over the world (Azam *etal* 2013). Adequate nutrition and healthy eating and physical exercise habits at this age are foundations for good health in adulthood. If the adolescents are well-nourished, they can make optimal use of their skills, talents and energies and would be healthy and responsible citizens. In point of this present study was undertaken for screening of selected adolescent girl nutritional status as per food habit.

Methodology:

Purposively 600 adolescent girls of 16-18 years were selected from urban and rural area of Parbhani District. Further the sample was categorized into 300 from urban and rural area of Parbhani district. Availability of adolescent girls was ascertained through visit to college, hostel and home. Using standard procedures anthropometry (Jelliffe, 1996 and WHO 1995) measurements of height (cm), weight (kg), mid- upper arm circumference (cm), waist- hip ratio of the selected 600 adolescent girls were recorded and compared with NCHS (1977) reference values.

The body mass index (BMI) was calculated by using by formula,(Shrilaxmi 2005)

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height}^2 \text{ (m)}}$$

On the basis of BMI, adolescent girls were categorized into different grade as below

Classification	BMI(kg/m ²)
Underweight	<18.5
Normal weight	18.50-24.99
Over weight	>25.00

Food and nutrient intake of all 600 adolescent girls was assessed by using 24 hours recall method for three consecutive days. Quantity of food stuff consumed by each subject was calculated by weightment method. The amount of food consumed was measured using standardized weighing machines, spoons, glasses and plates for measurements of the raw foodstuffs. From the recorded weights of the raw foodstuffs; the food intake of selected adolescent girls was calculated. By using food composition table of ICMR nutrient intake was calculated. To calculate the percent adequacy, food intake was compared with balanced diet and nutrient intake was compared with the (RDA) recommended dietary allowances given by (ICMR, 1999).

Result and discussion:

Anthropometric measurements of selected urban and rural adolescent girls as per different food habit

Anthropometric measurements of selected adolescent girls as per area and food habit were presented in Table 1. Anthropometric measurements of urban vegetarian and non vegetarian girls i.e. height (154.98 & 154.71 cm), weight (45.85 & 47.32 kg), BMI (19.25 & 18.28 kg/m²), mid upper arm circumference (23.14 & 23.87 cm), hip circumference (78.25 & 79.66 cm), waist circumference (72.27 & 76.68 cm), hip: waist ratio (72.27 & 76.68 cm) respectively. On the other side rural vegetarian and non vegetarian adolescent exhibits various anthropometric measurements were height (152.35 & 152.60 cm), weight (44.73 & 46.40 kg), BMI (19.69 & 17.35 kg/m²), mid upper arm circumference (19.69 & 17.35 cm), hip circumference (78.68 & 83.65 cm), waist circumference (62.84 & 63.95 cm) and hip: waist ratio (0.80 & 0.77 cm) respectively. However when considered statistically non-significant influence of food habit was noted for all studied parameter in both urban and rural area except for MUAC in urban girls which was significant at 5 per cent level.

Prevalence of under nutrition among selected urban and rural adolescent girls as per food habits

Table 2 reported about prevalence of under nutrition among selected urban and rural adolescent girls as per food habits. Almost 50 per cent urban girls belonging to vegetarian and non vegetarian group were found to be normal, whereas 100 per cent and 63.79 per cent rural adolescent girls of both food habits were found to normal. Mild grade of under nutrition was noted among urban adolescent (21.42 to 22.05 %) whereas none to 21.22 percent rural girl reported mild grade of under nutrition. Whereas (14.33 to 10.71 %) urban adolescent of both area exhibited moderate grade of under nutrition and 10.29 and 10.71 per cent reported sever under nutrition. On the contrary none of rural girls belonging to non vegetarian food habits does not record any type of malnutrition.

Mean food intake of selected adolescent girls as per food habit

The information regarding mean intake of food as per food habit is presented in Table 3. The consumption of cereals, pulses, roots and tubers, other vegetable and sugar was more among selected non-vegetarian adolescent girls. On the other hand among selected vegetarian adolescent girls consumption of green leafy vegetable, nuts and oilseeds, fruits, milk and milk products, fats and oils was found to be more. Whereas consumption of sugar and jaggery was almost equal among both the group adolescent girls. The recorded value of consumption of cereals, pulses, green leafy vegetable, roots and tubers, other vegetable, condiments and spices, nuts and oilseeds, fruits, milk and milk products, fats and oils, sugar and jaggery in both group of adolescent girls was 249.53 ± 42.98 g and 264.21 ± 36.99 g, 45.21 ± 23.82 g and 52.76 ± 40.53 g, 32.52 ± 18.59 g and 28.95 ± 17.29 g, 34.71 ± 21.71 g and 37.55 ± 25.39 g, 50.88 ± 30.55 g and 55.26 ± 29.66 g, 21.49 ± 7.90 g and 24.42 ± 12.19 g, 19.16 ± 7.16 g and 12.00 ± 0.00 g, 32.52 ± 20.40 g and 23.82 ± 10.36 g, 96.49 ± 31.74 ml and 73.68 ± 25.30 ml, 26.71 ± 5.86 g and 15.00 ± 2.85 g, 23.57 ± 7.17 g and 24.47 ± 4.16 g respectively. The consumption of food intake was below the ICMR recommendation. When critically observed statistically significant difference was noted for cereals, nuts and oilseeds, fruits, milk and milk products and fats and oils.

Per cent adequacy of food intake by adolescent girls as per food habits

The per cent adequacy of food intake as influenced by food habit is given in Table 4. The adequacy of food intake ranged from 17.35 to 94.30 per cent for vegetarian girls and 14.74-97.90 per cent for non vegetarians. In both group highest adequacy was recorded for sugar and jaggery (94.30-97.90 %) followed by cereals (75.62-80.06 %) and least adequacy recorded for roots and tubers (17.35-18.78 %) followed by milk and milk products (14.74-19.30 %), other vegetables (25.44-27.63 %). However per cent adequacy for pulses, green leafy vegetables, fruits found to be (60.29-70.35%), (28.95-60.29%), (23.82-32.52%) respectively.

Nutrient intake of adolescent girls as per food habits

Nutrient intake of adolescent girls as per food habit is depicted in Table 5. According to data maximum intake value recorded for protein 49.26 g, fat 43.86 g, iron 19.91mg, calcium 389.35mg, β -carotene 1878.81 μ g, riboflavin 0.80 mg, niacin 13.05 mg among vegetarian girls however on the other side intake of recorded value for energy 1759.68 kcal, thiamine 0.90 mg, folic acid 178.04 mg, vitamin C 61.35 mg and zinc 8.86 respectively was seen among non-vegetarian girls intake. When compared with RDA it was noticed that among vegetarian girls except fat and folic acid remaining were below the RDA. Whereas in non vegetarian girls except fat, folic acid and vitamin C remaining nutrients were below the RDA. Statistically significant difference was observed for niacin at

5 per cent level while energy, β -carotene, riboflavin, vitamin C and zinc were highly significant at 1 per cent level. However non-significant difference was noted for other nutrients.

Per cent adequacy of nutrient intake of adolescent girls as per food habit

Per cent adequacy of different nutrients as per food habits of adolescent girls is depicted in Table 6. The Table revealed that vegetarian adolescent girls recorded more per cent adequacy for protein (94.54 %), fat (125.31 %), iron (76.59 %), calcium (49.79 %), β -carotene (39.14 %), riboflavin (66.59 %), niacin (93.23 %) whereas intake for energy (72.12 %), thiamine (90.18 %), folic acid (118.69 %), vitamin C (153.82%) and zinc (73.81 %) was high among non-vegetarian girls. High per cent adequacy was observed for fat (116.34 and 125.31%) followed folic acid (114.71 and 118.6 %) and niacin (90.53 and 153.82 %) whereas lowest per cent adequacy noted for β -carotene (2.02-39.14 %) and calcium (40.40-49.79 %). Per cent adequacy for other nutrient intake was more than 59 per cent among the adolescent girls belonging to both groups.

Discussion:

When consider the influence of food habit on anthropometric measurement of adolescent girls no specific effect was noted in urban and rural girls with respect to height and weight. Significant difference was observed only for MUAC of urban girls. As increased in height is a genetic factor which is influence by the nutritional status. In the present study urban and rural adolescent girls did not exhibits any statistical significant with respect to height which revealed that growth potential in both the category was same. The difference in the height could be due to variation in consumption of food and many other reasons. Weight directly reflects the level of food consumption and are important factor contributing to the attainment of potential of growth in terms of height. Therefore change in height in the both group between vegetarian and non vegetarian could be justifiable with non-significant difference. Because of rare consumption of animal food by non vegetarian probably contributing for nutritional status difference among the groups for anthropometric measurements.

More percentage of vegetarian girls was normal and overweight also while non vegetarian girls were suffered from one or more degree of under nutrition. The studies conducted in Maharashtra state by Mane *etal* (2012), Jawarkar *etal* (2015) also reported that majority of participant were belonging to normal category. The more percentage of girls were normal this may be due to less physical activity. Selected participants were studied in 11th and 12th standard which was crucial period for study. As majority participant spent more time on study and less physical activity and limited outdoor playing and allied activities. Majority were from middle income group and staying in hostel which required less physical stress and consumption pattern was found to almost same. Majority were found to be normal body mass index. The more percentage of girls were normal this may be due to less physical activity. Selected participants were studied in 11th and 12th standard which was crucial period for study. As majority participant spent more time on study and less physical activity and limited outdoor playing and allied activities. Majority were from middle income group and staying in hostel which required less physical stress and consumption pattern was found to almost same. Majority were found to be normal body mass index.

Mean food intake of cereals, pulses, roots and tubers, other vegetables, condiment and spices, sugar and jaggery were found to be more among non-vegetarian adolescent contrary intake of green leafy vegetable, nuts and oilseed, fruits, milk and milk products, fats and oils was recorded more among vegetarian girls. The similar trend was noted for percent adequacy of food intake for both food habits.

When critically observed between food habits significant difference was noted for intake of energy, β -carotene, riboflavin, niacin, vitamin C and zinc. However nutrient intake were found to be lower than Recommended Dietary Allowances except for fat, folic acid and vitamin C. Consumption of non vegetarian food was rare hence between vegetarian and non vegetarian group non-significant difference was noted for almost many nutrients except B-complex vitamins. High per cent adequacy was observed for fat followed folic acid and niacin whereas lowest per cent adequacy noted for β -carotene and calcium Per cent adequacy for other nutrient intake was more than 59 per cent among the adolescent girls belonging to both groups. As regular diet is cereal based. The common consumed staple food were rich in carbohydrate and cooking pattern improves fat and oilseed intake. Kaur and Kaur (2011) noted in their study carried on rural adolescent girls and boys 16-18 years from Fatehgarh sahib, Punjab that intake of meat products ranges 0.6- 5 g which was very low. Zanver *etal* (2007) carried out study in Marathwada zone of Maharashtra state also reported the consumption of egg, meat or fish were rare. However these findings were in line with our finding.

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Table 1: Anthropometric measurements of selected urban and rural adolescent girls as per different food habits (n=600)

Anthropometric Measurements	Urban			Rural		
	Vegetarian	Non- vegetarian	't' value	Vegetarian	Non- vegetarian	't' value
Height (cm)	154.98 ± 5.76	154.71 ± 7.33	0.19^{NS}	152.35 ± 5.12	152.60 ± 4.55	1.44^{NS}
Weight (Kg)	45.85 ± 7.03	47.32 ± 9.02	0.83^{NS}	44.73 ± 5.05	46.40 ± 4.33	1.40^{NS}
MUAC (cm)	19.25 ± 2.91	18.28 ± 1.90	2.42*	19.69 ± 1.86	17.35 ± 2.63	0.84^{NS}
BMI Kg/m ²	23.14 ± 2.64	23.87 ± 3.29	1.14^{NS}	22.40 ± 1.82	22.75 ± 1.25	0.41^{NS}
Hip cir. (cm)	78.25 ± 11.31	79.66 ± 9.73	0.71^{NS}	78.68 ± 7.18	83.65 ± 3.93	1.54^{NS}
Waist cir. (cm)	72.27 ± 11.96	76.68 ± 19.98	1.14^{NS}	62.84 ± 6.66	63.95 ± 3.59	1.20^{NS}
Hip /waist ratio	0.91 ± 0.21	0.95 ± 0.3	0.70^{NS}	0.80 ± 0.12	0.77 ± 0.06	0.02^{NS}

*- Significant at 5 per cent level NS- Non Significant

Table 2: Prevalence of under nutrition among selected urban and rural adolescent as per food habit (n=600)

Different grades of under Nutrition	Urban		Rural	
	Vegetarian	Non- vegetarian	Vegetarian	Non- vegetarian
Severe	28 (10.29)	3 (10.71)	10 (3.44)	0 (0.00)
Moderate	39 (14.33)	3 (10.71)	27 (9.31)	0 (0.00)
Mild	60 (22.05)	6 (21.42)	63 (21.72)	0 (0.00)
Normal	137 (50.36)	14 (50.00)	185 (63.79)	10 (100.00)
Obese	8 (2.94)	2 (7.14)	5 (1.72)	0 (0.00)
Total	272	28	290	10

Figures in parenthesis indicate percentage.

Table 3: Mean food intake of selected adolescent girls as per Food habit (n=600)

Particular	Vegetarian	Non- Vegetarian	Balance diet	't' value
Cereals (g)	249.53 ±42.98	264.21±36.99	330	2.34**
Pulses (g)	45.21±23.82	52.76± 40.53	75	1.13^{NS}
Green leafy Vegetable(g)	32.52±18.59	28.95 ±17.29	100	1.23^{NS}
Roots & Tubers (g)	34.71±21.71	37.55±25.39	200	0.67^{NS}
Other vegetables (g)	50.88±30.55	55.26 ±29.66	200	0.87^{NS}
Condiments and spices (g)	21.49±7.90	24.42±12.19	---	1.46^{NS}
Nuts and oilseeds (g)	19.16±7.16	12.00± 0.00	----	23.56**
Fruits (g)	32.52±20.40	23.82±10.36	100	4.16**
Milk and milk Products (ml)	96.49 ±31.74	73.68±25.30	500	5.28**
Fats & oil (g)	26.71±5.86	15.00±2.85	35	22.34**
Sugar & jaggery (g)	23.57 ±7.17	24.47±4.16	25	1.22^{NS}

NS-non significant, **- significant at 1 per cent

Table 4: Percent adequacy of food intake by adolescent girls as per food habits (n=600)

Particular	Vegetarian	Non-vegetarian
Cereals (g)	75.62	80.06
Pulses (g)	60.29	70.35
Green leafy Vegetable (g)	32.52	28.95
Roots & Tubers (g)	17.35	18.78
Other veg. (gm)	25.44	27.63
Fruits (g)	32.52	23.82
Milk and milk products (ml)	19.30	14.74
Fats & oil (g)	76.32	42.86
Sugar & jaggery (g)	94.30	97.90

Table 5 : Mean nutrient intake of adolescent girls as per food habits (n=600)

Particular	Vegetarian	Non-vegetarian	RDA	't' value
Energy (Kcal)	1653.91 ± 285.20	1759.68 ± 195.63	2440	3.11**
Protein (g)	49.26 ± 8.94	47.09 ± 6.79	52.1	1.86^{NS}
Fat (g)	43.86 ± 27.00	40.72 ± 10.19	35	1.56^{NS}
Iron (mg)	19.91 ± 5.36	19.38 ± 3.76	26	0.82^{NS}
Calcium (mg)	398.35 ± 171.30	323.20 ± 248.08	800	1.84^{NS}
β-carotene (μg)	1878.81 ± 2851.98	96.93 ± 218.99	4800	14.20**
Thiamine(mg)	0.76 ± 0.50	0.90 ± 0.49	1.0	1.71^{NS}
Riboflavin(mg)	0.80 ± 0.70	0.70 ± 0.14	1.2	2.67**
Folic acid (mg)	172.06 ± 70.12	178.04 ± 48.23	150	0.71^{NS}
Niacin (mg)	13.05 ± 8.43	11.68 ± 2.70	14	2.44*
Vitamin C (mg)	36.21 ± 16.33	61.53 ± 31.99	40	4.84**
Zinc (mg)	6.77 ± 4.07	8.86 ± 1.22	12	7.99**

NS-non significant, **- significant at 5 per cent, *- significant at 1 per cent

Table 6 : Percent adequacy of nutrient intake among selected adolescent girls as per food habit (n=600)

Particular	Vegetarian	Non- vegetarian
Energy (Kcal)	67.78	72.12
Protein (g)	94.54	90.39
Fat (g)	125.31	116.34
Iron (mg)	76.59	74.54
Calcium (mg)	49.79	40.40
β -carotene (μ g)	39.14	2.02
Thiamine(mg)	76.09	90.18
Riboflavin(mg)	66.59	58.56
Folic acid (mg)	114.71	118.69
Niacin (mg)	93.23	83.43
Vitamin C (mg)	90.53	153.82
Zinc (mg)	56.39	73.81

