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Comparative analysis of health status of selected 16-18 years adolescent girls

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Abstract

Present study is undertaken to assess health status of selected 16-18 years adolescent girls residing in Parbhani district, Maharashtra. Total 600 adolescent girls were selected from Parbhani district of Maharashtra state. Health status of selected adolescent girls 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. Health status was measured by assessing Body mass index. 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 as per age and income statistically non- significant difference was noted for all anthropometric measurements among different income group except hip: waist ratio of 16 years girls and waist circumference among 17 and 18 years girls. Whereas 61.32 percent and 60.13 percent girls of 16 years and 17 years were found to be normal whereas 18 years of girls were either mild, moderate degree of under nutrition and over nutrition. Negligible difference was noted among all age group for intake of pulses, green leafy vegetable, condiments and spices, nuts and oilseeds, fats and oils, sugar & jaggery. Further it was also reported that except for intake of fats and oils remaining foods were below than Recommended Dietary Allowances. Further the percent adequacy of cereal, pulses, sugar and jaggery found to be maximum followed by fats and oil seeds. While incase of nutrient intake it was observed that except fat and vitamin C remaining nutrient was below than Recommended Dietary Allowances. Whereas 100 percent nutrient adequacy noted for fat, folic acid vitamin c respectively.

Keywords: Health status, 16-18 years adolescent girls, anthropometric

Introduction

Adolescence is the future generation of any country. Their nutritional needs are critical for the wellbeing of a society but for many years, their health has been neglected because they are considered to be less vulnerable to diseases compared to relatively young children or the old people. 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. Anthropometry can be used for various purposes, depending on the anthropometric indicators selected. The nutritional status of adolescent age group is difficult to assess because there is not a reference standard for adolescents and there is a growth spurt which occurs with puberty which occurs at different ages. Adolescent anthropometric assessment is used to reflect under nutrition. Anthropometry is also used to reflect over nutrition but this is not the focus of this guide. Under nutrition in adolescents is characterized by patterns of acute and chronic deficiency of energy, protein and micronutrients including vitamins and minerals. Nutritional requirement in relation to body size is more during adolescence. Majority of the girls do not achieve their full height and weight potential on account of their dietary insufficiencies.

Adolescence, a second period of rapid growth may serve as an opportunity for compensating faltered early childhood growth though the potential for significant catch-up is limited. Adolescence, one of the nutritional stress period of life with profound grow comes with increased demands for energy, protein, minerals and vitamins such as vitamin B6, B9, B10, vitamin A and vitamin C.

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Thiamine and riboflavin play essential roles in energy metabolism so are important in this cycle.

Often health and nutritional status of adolescent girls are direct reflection of the cumulative effects of physical growth, the onset of menarche and increase in fat and muscle mass which place extra nutrition requirements on them. Physical growth of adolescent girls integrately related to their dietary intake which is determined by availability of food in terms of quality and quantity and the ability to digest, absorb and utilize food. Food availability is influenced by dietary practices, cultural traditions, family structure, birth intervals, meal patterns, and food allocation. At the same time, digestion and absorption can be impeded by infection as a result of lack of environmental sanitation.

Changes in body dimensions reflect the overall health and welfare of individuals and populations. Anthropometry is used to assess and predict performance, health and survival of individuals and reflect the economic and social wellbeing of populations. Therefore present study under taken for comparative analysis of health status of selected 16-18 years adolescent girls residing in Parbhani district, Maharashtra.

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. The anthropometric status of selected adolescent girls was determined by recording height (cm), weight (kg), mid upper arm circumference (cm), waist circumference (cm), hip circumference (cm) and hip: waist ratio. Body Mass Index was calculated using value of height and weight. On the basis of Body Mass Index, adolescent girls were categorized into different grades of under nutrition. 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) [3].

Result

Anthropometric measurements of adolescent girls as per age and income group

Data on anthropometric measurements i.e. height, weight and BMI of adolescent girls as per age and income group is presented Table 1A. It was observed that adolescent girls of 16years and 18years from income group Rs.<10,000 exhibits higher value for BMI, and income group Rs.>20,001 exhibited better value for height, weight for both the age groups of adolescent girls respectively. Further in case of girls of 17 years, it was noted that income group Rs. < 10,000/- exhibits more value for height, weight, whereas BMI was recorded more in income group Rs.10,001– 20,000/. In nutshell, It can be observed that measured anthropometrics parameters were below the NCHS standards.

Table 1B. presented the data on anthropometric measurements viz. mid arm circumference, hip circumference and waist circumference and hip: waist ratio of adolescent girls as per age and income group. It is revealed from the table that adolescent girls from income group Rs.<10,000 exhibits higher value for mid upper arm circumference while adolescent girls belonging to income group Rs.10,001 to 20,000 showed higher value for hip: waist ratio and adolescent girls from income group Rs. >20,001 exhibited comparatively better value for waist circumference respectively. Statistically non-significant difference was noted among different income group except hip: waist ratio of 16 years girls and waist circumference among 17 and 18 years girls.

Table 1A: Anthropometric measurements of adolescent girls as per age and income group (n=600)

Income Group (Rs. Per month)	16 years			17years			18years		
	Height (cm)	Weight (Kg)	BMI (Kg/m ²)	Height (cm)	Weight (Kg)	BMI (Kg/m ²)	Height (cm)	Weight (Kg)	BMI (Kg/m ²)
<10000	154.17	45.87	20.63	153.17	44.47	18.83	153.54	45.16	18.335
10001-20000	154.57	45.80	20.36	153.37	45.45	18.77	153.28	45.94	17.947
>20001	153.33	46.39	20.21	152.97	45.41	18.70	156.10	46.42	17.870
NCHC Standard	162.1	55.9	21.3	162.1	55.9	21.3	162.1	55.9	21.3
'f' value	0.598 ^{NS}	0.122 ^{NS}	0.526 ^{NS}	0.112 ^{NS}	0.880 ^{NS}	0.066 ^{NS}	1.946 ^{NS}	0.298 ^{NS}	0.719 ^{NS}
CD	----	---	----	---	---	---	---	---	---

Table 1B: Anthropometric measurements of adolescent girls as per age and income group (n=600)

Income Group (Rs.Per month)	16 years				17 years				18 years			
	MUAC (cm)	Hip circumference (cm)	Waist circumference (cm)	Hip/waist Ratio	MUAC (cm)	Hip circumference (cm)	Waist circumference (cm)	Hip/waist Ratio	MUAC (cm)	Hip circumference (cm)	Waist circumference (cm)	Hip/waist Ratio
<10000	22.68	80.25	66.45	0.80	22.72	77.55	65.05	0.87	23.50	79.84	70.86	0.87
10001-20000	22.63	79.63	65.98	0.87	22.86	78.50	67.02	0.88	22.77	77.93	71.28	0.91
>20001	23.26	81.47	67.70	0.83	22.82	77.48	70.17	0.86	23.05	73.75	80.21	0.87
'f' value	1.36 ^{NS}	0.57 ^{NS}	0.35 ^{NS}	3.79*	0.11 ^{NS}	0.34 ^{NS}	4.66*	0.10 ^{NS}	0.09 ^{NS}	2.88 ^{NS}	4.41*	0.39 ^{NS}
CD	----	----	----	0.055	---	---	3.657	---	---	---	7.572	---

* - Significant at 5% level, NS- Non Significant

Prevalence of under nutrition in selected adolescent girls per age and family income group

Table 2 depicted the information on prevalence of under nutrition among selected adolescent girls as per age and income group. It was revealed that maximum adolescent (60.50 to 68.88%) among 16 years, (56.52 to 56.77%) among 17 years and (41.67 to 65.00%) among 18 years were found to be normal. Whereas 4.16 to 11.11 per cent. 5.79 to 6.14 per cent and 9.68 to 15.00 per cent among 16, 17 and 18 years

adolescent were found to be in the category of severe grade of under nutrition. Further it was noted from the table that as the monthly income of the family increased per cent of normal girls increased from 60.50 per cent (Rs.<10,000 per month) to 68.88 per cent (Rs. >20,001 per month). However 8.88 per cent to 33.33 per cent girls were categorized as mild grade under nutrition followed by moderate grade under nutrition (8.88 to 22.58%). Irrespective of age and income negligible number of adolescent girls was observed obese.

Table 2: Prevalence of under nutrition among selected adolescent girls per age and family income group (n=600)

Different grades of under nutrition	16 years			17 years			18 years		
	Income (Rs. Per month)			Income (Rs. Per month)			Income (Rs. Per month)		
	<10000	10001-20000	>20001	<10000	10001-20000	>20001	<10000	10001-20000	>20001
Sever	6 (5.04)	2 (4.16)	5 (11.11)	8 (6.77)	7 (6.14)	4 (5.79)	4 (11.11)	3 (9.68)	3 (15.00)
Moderate	11 (9.24)	6 (12.5)	4 (8.88)	13 (11.01)	13 (11.40)	9 (13.04)	5 (13.88)	7 (22.58)	0 (0.00)
Mild	28 (23.52)	8 (16.66)	4 (8.88)	28 (23.72)	28 (24.56)	15 (21.74)	12 (33.33)	3 (9.68)	3 (15.00)
Normal	72 (60.50)	30 (62.52)	31 (68.88)	67 (56.77)	64 (56.14)	39 (56.52)	15 (41.67)	15 (48.39)	13 (65.00)
Obese	2 (1.68)	2 (4.16)	1 (2.22)	2 (1.69)	2 (1.75)	2 (2.89)	0 (0.00)	3 (9.68)	1 (5.00)
Total	119	48	45	118	114	69	36	31	20

Figures in parenthesis indicate percentage

Mean food intake of selected adolescent girls as per age

Mean food intake of selected adolescent girls as per age is described in Table 3. From the table it can be revealed that the consumption of cereals, pulses, other vegetable and fruits was found to be more among 17 years of adolescent girls. On the other side consumption of roots and tubers, condiments and

spices, milk and milk products and fats and oils was more among adolescent girls of 18 years. Whereas consumption of green leafy vegetable, nuts and oil seeds and sugars were at par. As per the ICMR recommendation food intake among three age groups was found to be below the recommendation.

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

Family income (Rs. per month)	Cereals (g)	Pulses (g)	Green leafy Vegetable (g)	Roots & Tubers (g)	Other vegetable (g)	Condiments and spices (g)	Nuts and oilseeds (g)	Fruits (g)	Milk and milk products (g)	Fats and Oils (g)	Sugar & jiggery (g)
<10000	247.25±42.27	44.29±23.91	31.96±16.39	32.59±20.45	46.37±27.55	21.05±7.38	16.29±6.43	31.08±19.75	84.10±23.37	23.96±7.09	22.93±7.43
10001-20000	255.63±48.44	44.72±23.51	34.68±21.10	37.53±23.27	53.81±31.21	21.56±8.82	20.48±6.55	27.90±4.44	98.97±25.73	27.90±4.44	25.63±6.48
>20001	251.84±39.24	48.23±27.69	31.22±19.37	36.38±22.73	56.12±32.79	18.19±11.37	20.87±7.43	28.33±17.46	107.46±39.24	27.51±5.58	23.28±6.55
RDA	330	75	100	200	200	---	---	100	500	35	25
't' value 1 vs 2	1.67 ^{NS}	0.17 ^{NS}	1.28 ^{NS}	2.05*	2.29*	0.56 ^{NS}	5.97**	3.72**	5.51**	6.75**	3.70**
1 vs 3	1.21 ^{NS}	1.62 ^{NS}	0.44 ^{NS}	1.89 ^{NS}	3.41**	1.96*	6.97**	1.60 ^{NS}	7.50**	6.10**	0.55 ^{NS}
2 vs 3	0.74 ^{NS}	1.22 ^{NS}	1.49 ^{NS}	0.44 ^{NS}	0.64 ^{NS}	0.99 ^{NS}	0.42 ^{NS}	6.02**	2.36*	0.69 ^{NS}	3.17**

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

Per cent adequacy of food intake among adolescent girls as per age

Table 4 revealed the per cent adequacy of food intake by adolescent girls of different age groups. In all three age group the adequacy was maximum for sugar and jaggery (89.25-99.26%), fats and oils (78.86-80.12%) and cereals (78.90 -

78.66%) and minimum for roots and tubers (16.13-20.01%) and milk and milk products (16.90 -23.45%). However per cent adequacy for pulses, green leafy vegetables, other vegetable, fruits found to be (57.92 -64.90%), (30.45 - 33.53%), (21.29 - 28.99%), (27.12- 36.30%) respectively.

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

Nutrient intake of adolescent girls as per income

Mean nutrient intake of adolescent girls as per income is presented in Table 5. It is revealed from the table among three income group higher values for the intake of energy (1680.75 kcal), fats (44.93 g), thiamin (0.87mg) and zinc (7.31mg) was recorded by adolescent girls belonging to low income group. In higher income group more nutrient intake was noted for iron (21.55 mg), calcium (493.26 mg), β -carotene (3480.61 μ g), riboflavin (0.96 mg), niacin (13.43 mg), and vitamin C (44.11 mg) respectively. From the data it is revealed that among three income groups intake of fats and folic acid were

above the recommended dietary allowances and remaining nutrients were below the recommended dietary allowances. When compared between low and middle income group statistically significant difference was observed for β -carotene, riboflavin folic acid, vitamin C and zinc. When compared between middle and higher income group statistical difference was noted for iron, calcium, β -carotene thiamine and vitamin C intake. However nutrient intake among low and high income adolescent was compared it was found that except protein, fat, folic acid, niacin, thiamin and zinc, other nutrients exhibits statistically significant difference.

Table 5: Nutrient intake of college going adolescent girls as per age (n=600)

Particular	16 years	17 years	18 years	RDA	't' value		
					16 vs 17 years	16 vs 18 years	17 vs 18 years
Energy (Kcal)	1642.54±269.45	1695.45±287.57	1590.13±274.27	2440	2.12*	1.54 ^{NS}	3.18**
Protein (g)	49.05±10.33	49.35±8.24	48.54±6.70	52.1	0.36 ^{NS}	0.56 ^{NS}	0.97 ^{NS}
Fat (g)	45.11±39.91	41.75±13.17	46.47±16.14	35	1.18 ^{NS}	0.42 ^{NS}	2.55*
Iron (mg)	19.56±4.82	19.08± 5.54	23.19±3.96	26	1.03 ^{NS}	6.87**	7.85**
Calcium (mg)	374.36±235.59	373.61±120.66	502.18±134.78	800	0.04 ^{NS}	5.96**	8.19**
β -carotene (μ g)	879.61±1539.50	1480.91±1874.67	4725.54±4854.57	4800	3.96**	7.44**	6.27**
Thiamine(mg)	0.79±0.39	0.83±0.60	0.51±0.24	1.0	0.87 ^{NS}	7.71**	7.48**
Riboflavin(mg)	0.68±0.15	0.77±0.26	1.14±1.61	1.2	4.95**	2.73**	2.18 ^{NS}
Folic acid (mg)	154.33±44.04	181.73±68.26	184.27±102.40	150	5.49**	2.70**	0.22 ^{NS}
Niacin (mg)	13.35±4.88	12.30±3.55	14.21±18.51	14	2.65**	0.44 ^{NS}	0.98 ^{NS}
Vitamin C (mg)	43.69±23.28	30.57±11.75	47.62±16.05	40	7.55**	1.70 ^{NS}	9.43**
Zinc (mg)	7.38±1.59	6.63±1.39	6.66±9.56	12	5.50**	0.71 ^{NS}	0.04 ^{NS}

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

Per cent adequacy of nutrients intake of selected adolescent girls as per age

Per cent adequacy of nutrients intake of selected adolescent girls as per age is presented in Table 6. The highest per cent adequacy of nutrient was noted as per age for fat (119.29 – 132.77%), followed by folic acid (102.89- 122.85%). However more than 50 per cent adequacy was recorded for vitamin C, niacin, protein, iron, calorie and riboflavin (76.41-119.04%, 87.89-101.50%, 93.16-94.73%, 73.39-89.21%, 65.17-69.48% and 56.47-94.68%). Further it was also observed that least per cent adequacy was noted for β -carotene (18.33- 98.45%) followed by calcium (46.70-62.77%).

Table 6: Percent adequacy of nutrient intake of adolescent girls as per age (n=600)

Particular	16 years	17 years	18 years
Energy (Kcal)	67.32	69.49	65.17
Protein (g)	94.14	94.73	93.16
Fat (g)	128.87	119.29	132.77
Iron (mg)	75.22	73.39	89.21
Calcium (mg)	46.79	46.70	62.77
β -carotene (μ g)	18.33	30.85	98.45
Thiamine(mg)	79.45	83.23	51.21
Riboflavin(mg)	56.47	64.07	94.68
Folic acid (mg)	102.89	121.15	122.85
Niacin (mg)	95.35	87.89	101.50
Vitamin C (mg)	109.21	76.41	119.04
Zinc (mg)	61.48	55.24	55.54

Discussion

Result revealed that the highest and lowest value for height and weight was ranging between 92-96 per cent and 80-90 per cent when compared with NCHS standard with respect of all group. Middle income group recorded better value for all anthropometric measurement than low and high income group. Though the middle group recorded better height non-

significant difference was noted in other group it may be due to variations in consumption pattern, the population selected were from girls residing at home and hostel (50% each) and food pattern, daily diet was observed same.

More percent of normal girls were 16 years and majority of 18 years adolescent girls were categorized under the grade of mild, moderate and overweight, while 17 years girls were suffering with severe under nutrition. The studies conducted in Maharashtra state by Zavar and R. Devi (2008) [9], Mane *et al.* (2012) [6], Jawarkar *et al.* (2015) [4] 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.

As per age it was also noticed that intake of green leafy vegetable, roots & tubers, condiments and spices, fruits, milk and milk products and fats and oils was found to be high among adolescent girls belonging to 18 years, intake of cereals, pulses, other vegetable, nuts and oilseeds, sugar & jaggery was found to be more among 17 years old, among 16 years adolescent girls food intake was less than their counterpart and negligible difference was noted among all age group for intake of pulses, green leafy vegetable, condiments and spices, nuts and oilseeds, fats and oils, sugar & jaggery. Further it was also reported that except fats and oils remaining foods were below than Recommended Dietary Allowances. Twara *et al.* (2015) [8] reported that the average daily consumption of food groups by the adolescent girls of 13 to 15 years and 16 to 18 years was showed that consumption of all the food groups in adolescent girls was very low than the suggested amount. When seen critically it is crystal clear from

the result that the percent adequacy of cereal, pulses, sugar and jaggery found to be maximum followed by fats and oil seeds.

As per age it was also noticed that intake of minerals, vitamins and fat was found to be high among adolescent girls belonging to 18 years, intake of thiamine was found to be more among 17 years old, zinc was found to be higher among 16 years adolescent girls and negligible difference was noted among all age group for intake of energy and protein. The similar trend was noted about mean food intake as per different criterion. Further it was also reported that except fat and vitamin C remaining nutrient was low than Recommended Dietary Allowances. Twara *et al.* (2015)^[8] conducted study on 13-15 and 16-18 years adolescent girls from Motihari town, Bihar reported dietary inadequacy in respects of energy, protein and micronutrients. Nisha and Varsha (2016)^[7] carried out study on adolescent girls 13-15 years and 16-17 years at Fatehabad, Haryana state noted that except fat remaining nutrients were lower than Recommended Dietary Allowances which was in line with present study. When consider age wise, food habit and income wise per cent adequacy was found to be highest for fat, folic acid and vitamin C and lowest adequacy was noted for β - carotene and calcium. Hanagi *et al.* (2006)^[2] conducted study at Dharwad taluka, Karnataka state reported that the adequacy of protein intake was 46 and 44 per cent and that of vitamin B12 was 54 and 49 per cent respectively. The intake of vitamin A, vitamin B6 and Zinc was less than 20 per cent adequate.

Conclusion

It is necessary to give proper education about dietary intake as per age to adolescent girls and their mothers also.

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