Evaluation of nutritional status of adolescents residing in residential schools of Hyderabad

S. Uzma Nabeela[1] and Aruna Mesa[2]

Department of Home science, SPMVV. Tirupati, SPMVV,
Tirupathi - 517502 (India)

Abstract

Nutritional status assessment of adolescents was conducted using anthropometric and dietary assessment. Altogether 320 participants were included in the study with a defined criteria for inclusion. Any adolescent individual of age group 13-16years with no previous medical history was included in the study. Overall, it was found that the participants lack optimum nutritional status as compared with the said anthropometric standards and recommended dietary allowance. Dietary survey showed inadequate consumption of micronutrients especially minerals like calcium and iron which essential at this physiological age group. The diets lacked in Millets, fruits and green leafy vegetables. Hence these aspects can be taken care to overcome the problem of malnutrition despite of their low socio-economic backgrounds.

Key words : Adolescents, Nutritional status, diet survey, residential schools, Anthropometry.

As per WHO Adolescence is the phase between childhood and adulthood with age ranging between 10 to 19 years[6]. Adolescence is marked by physical, emotional and cognitive development which are also accomplished during this stage of life. On an average increase vertical growth is very apparent, males grow 8 inches taller and females 6 inches taller. There are changes with regard to body composition where males double his lean body mass and females doubles her fat deposition. This is also the time period where nutritional deficiencies can occur. Poor diet is one among the leading risk factor for health in adolescents which can have long term complications.[6] Malnutrition is both lack and excess intake of nutrients or malabsorption of nutrients. Thus, Adolescence is a period where nutriture of the body is important to prevent malnutrition[1].

Increase in lean Body mass, skeletal mass and body fat results in energy and nutrients needs that exceed than other age group. Thus, nutritional screening and assessment can help in identifying the risk of malnutrition at earliest. Most common adolescent problems are underweight, overweight, eating disorders,

[1]Research Scholar, [2]Professor

hyperlipidaemia, iron deficiency and hypertension. Nutritional screening that includes anthropometry measurements helps in determination of obesity or underweight individuals and accordingly action can be suggested. Nutritional screening also includes dietary assessment which includes 24 hr dietary recall, food frequency questionnaire or food inventory or food records or may be self -assessment questionnaire etc. These assessment techniques also help to identify macro & micro nutrient deficiencies' and can allow its correction. Poor diet quality or nutrition related health risk can be understood easily by nutritional interventions.

Studies on Nutritional statuses are critical for modifying the policies in combating micro and macro nutrient malnutrition which will help in attaining the goals set by WHO.

To conduct Nutritional screening, adolescent girls and boys residing in a residential school were selected. Prior permission and institutional ethical consent was taken. Assent and consent from the parents and the ward was also taken.

Sample profile :

Students of age group between 13-16 years were selected who were inhabitants of residentials schools. Adolescent boys and girls of standard 8th, 9th and 10th were included in the study. Participants with existing health problems or mental illness and those above or below the targeted age group were excluded from the study.

Nutritional screening :

Anthropometry is a human body measurement and is used to assess the nutritional status as well as growth and development[4]. Anthropometric measurements like height, weight, waist and hip were measured and waist to hip ratio, BMI was calculated. All together 136 boys and 217 girls were screened, of which 106 boys and 214 girls were included in the study.

Height assessment :

Height is a long -term indicator of Nutritional status. Height of these individuals were assessed using a portable stadiometer and the calibrations were given in centimetres. All necessary instruction was given like equal distribution of body weight, no crown or caps were allowed. Standing height was thus measured following the guidelines given by National Health and Nutrition Examination Survey (NHANES). Participants were instructed to adhere to contact points to stadiometer which are both heels, buttocks, back of the head and shoulder blades and head parallel to Frank fort plane. The values were rounded off to nearest 0.5cms.

Weight assessment :

Adolescent nutritional status can also be known by using a short-term indicator of nutritional status. Weight of these individuals were assessed using a Lifetron Digital health scale. Prior to assessment participants were instructed to stand distributing their body weight equally on both legs. The weight was measured in kilograms. From this data weight for age (underweight) category can be assessed using Gomez Classification.

Waist & hip measurements :

Waist & hip measurements helps to identify abdominal obesity and its related health

problems. Using a non-flexible metre tape, narrowest part of waist and widest part of hip was measured and noted to calculate waist to hip ratio. A waist to Hip ratio of >0.8 in females and >0.9 in males indicates abdominal obesity. A waist Circumference e" 35inches or 88cms and 40 inches or 102cms in males is considered to as an abdominal obesity.

Body mass index :

BMI or Body Mass Index or quetlet index is a statistical measure of weights to the heights of an individual which estimates the body fat/ general obesity / deposition of fat for males & females of any age. Standard BMI ranges are given by WHO[6] for both Asian and non- Asian populations. A BMI below 18.5 kg/m^2 indicate undernutrition and BMI above 22.9kg/m^2 for Asian population is considered over weight. WHO Standards for Asian and non-Asians is given in table-1.

Waist Circumference & BMI can be used to determine abdominal obesity and obesity- related comorbidities.[5]

Dietary Assessment :

Food inventory is the best suited method for assessing the average nutrient intake by individuals of residential schools. Dietary data about cyclic menu, weekly purchase of food items, stock remained after a week and commonly bought food stuff was noted by interview with warden of the residential school. Data for a period of 8 days which includes two Sundays and weekday was noted to prevent inaccuracy.

Statistical analysis :

The data generated was subjected to statistical analysis and the data is presented in terms of means, frequencies and percentages.

Anthropometric assessment :

Mean age was 14±0.8 and mean height among boys was found to be 155±8.5, mean weight is around 44±9.8, waist to hip ratio was 0.8±0.06 and Mean BMI was 18.4±3.04. With respect to girls the mean age was 14±0.9 and mean height, weight and waist to hip ratio was 150±11.7, 44±9.8, 0.8±0.06 and BMI was 19.1±2.89 respectively.

The mean Heights and weights of both genders age wise is compared with the

Table-1. WHO standards for Asians & Non-Asians[5]

Category	WHO BMI ranges for non-Asians	Asian & South Asian population
Severely Underweight	<16.5kg/m^2	
Underweight	<18.5 kg/m^2	
Normal	≤ 18.5 kg/m^2 to 24.9 kg/m^2	
Over weight	≥ 25 kg/m^2 to 29.9 kg/m^2	23 to 24.9 kg/m^2
Obese	≥ 30kg/m^2	>25 kg/m^2
Class I obesity	30 kg/m^2 to 34.9 kg/m^2	
Class II obesity	35kg/m^2 to 39.9kg/m^2	
Class III obesity	≥ 40kg/m^2	

standards laid by IAP and found to be below the standards as adopted by Yaatinamani and balamatti[7] study. The data is mentioned in table-2.

Table-2. Comparison with IAP Standards for Heights

Participants Age	Heights				Weights			
Age(y)	IAP (2015)		Participants Measurements		IAP (2015)		Participants Measurements	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
13	152.2	154.3	149.7(57)	146.6(31)	43.6	43.3	41.0(57)	35.1(31)
14	154.7	159.9	151.0(88)	155.9(38)	46.4	48.2	44.6(88)	46.7(38)
15	155.5	164.5	152.7(51)	1620(37)	48.4	53.1	45.3(51)	51.1(37)
16	156.9	168.1	151.1(18)	-	49.7	56.8	42.8 (18)	-
N=214 N=106								

Out of 214 girls' participants, 98 students were found to be underweight and 15 students were overnourished. Like- wise out of 106 boys, 60 students were under weight and 10 were overweight. Waist to hip ratio was found to be higher than normal in girls, almost 85 participants have Waist to Hip ratio greater than 0.8 which indicates risk of lifestyle disorders. In case of boys 13 participants have high waist to hip ratio > 0.9.

Table-3. Students Anthropometric results based on BMI

Category	BMI ranges	No. of Participants	
		Girls	Boys
Severely Underweight	<16.5kg/m^2	14.9% (32)	29.8% (31)
Underweight	<18.5 kg/m^2	30.8% (66)	27.8% (29)
Normal	$\leq$ 18.5 kg/m^2 to 22.9 kg/m^2	47.1% (101)	34.6% (36)
Over weight	23 to 24.9 kg/m^2	4.2% (09)	5.7% (06)
Obese	>25 kg/m^2	1.8% (04)	3.8% (04)

Weight for age identifies individuals with undernutrition. From the data collected 33% girls & 23% boys were having Normal Nutritional status. 48% & 45 % were having I degree malnutrition. II-degree malnutrition among girls & boys was found be 16.5% and 31.7% respectively. III -degree malnutrition was not seen in girls but around 2% were found to be have <60% weight to their Ideal body weight in case of boys. The distribution in terms of number is given in the table-7.

Table-4. Gomez Classification- Weight for Age

Nutritional Status	Wt. for age (%)	No. of Participants	
		Girls	Boys
Normal	>90% of IBW	71	24
I -Degree malnutrition	75-90%	103	47
II-Degree Malnutrition	60-75%	40	33
III -Degree Malnutrition	<60%	0	2

Poor anthropometric measurements could be because of various factors like Pre existing malnutrition, worm infestation, food choices, isolation from family, acceptability of food prepared etc as also seen in study by Prabhakaran[2], Yaatinamani and balamatti [7].

Around 0.9% (2) adolescents reported to have high waist circumference rest were under normal ratio. In case of boys only 1 participant have high waist circumference. In case of W:H ratio, girls' participants have high waist to hip ratio than boys almost about 47.6% (102) and 12.5% (3) respectively.

Dietary assessment : A cyclic Menu is followed in the residential schools. Students were given rice as an everyday staple in form of plain rice, khichdi, zeera rice and Idli or upma were given occasionally. Pulses in form of sambar and dal with any vegetable added to it is given on a daily basis. Green Leafy vegetables like cabbage were consumed very rarely and consumption of other seasonal vegetables like bottle gourd, brinjal, ridge gourd, lady's finger, tinda, tomatoes, cauliflower and beans were given. Roots & tubers like potato, onions, sweet potato were given twice a week. Fruits like Papaya, banana and orange are given thrice a week. Almost 100g of chicken was given per student once a week and 150g to students participating in sports. Egg was given twice a week. Dairy products like buttermilk & Milk was given daily almost 100ml per head with boost added to it. Rarely consumed food items were chikki, dessert, Parle- G biscuits. The ingredients from the cyclic menu were converted into per day energy, protein, carbohydrate, fat, calcium & iron consumption per child and the data was compared with RDA 2020 given in table-5.

The average nutrient intake was calculated from the data obtained. There was a huge deviation in the calorie consumption, calcium & iron from the recommended dietary allowances for both adolescent boys and girls. There was a extreme lack in consumption of calcium and iron and hence micro nutrient deficiency can be seen. The intake of protein and fat was beyond the RDA.

Table-5. Average Nutrient Intake

S. No.	Participants	Energy (k. Cal)	Protein (gm)	Fat (gm)	CHO (gm)	Calcium (mg)	Iron (mg)
1.	GIRLS (n=214)	1731±473	81±26.8	65±10.6	194±176	443±393	13±12
2.	BOYS (n=106)	1547±928	65±14.3	58±2.2	186±252.3	382±436	8.75±9.3

Table-6. Comparison of Nutrient intake with RDA

Nutrients	Girls	RDA	% diffe-rence	Boys	RDA	% diffe-rence
Energy (K.cal.)	1731	2400	-28%	1547	2860	-46%
Protein (g)	81	43	88%	65	45	45%
Fat (g)	65	50	30%	58	55	6%
Carbohydrates(g)	194	444*	-56%	186	543*	-66%
Calcium(mg)	443	1000	-56%	382	1000	-62%
Iron(mg)	13	30	-57%	8.75	22	-60%

* calculated

From Table 10 indicated the difference in the consumption of nutrients against the recommended RDA 2020 showed a lack of calcium & iron along with energy intake in both genders. Girls are falling short of energy by 28% and boys 46%. The energy requirement is met mainly through proteins and fats instead of carbohydrates. Contribution to energy via proteins is 18.7% while that of fat is 33.6% with regard to girls intake and 16.8%, 33.7% for boys intake. Although the protein intake is beyond the recommendations there is still a lack of micronutrients consumption especially calcium & iron. This inadequacy can be attributed to lack of consumption of green leafy vegetables, millets and fruits foods in the diet.

From the above data obtained it is to be noted that these adolescents are at risk of developing micronutrient deficiency especially calcium and iron deficiency and it may precipitate to reduced bone mass and nutritional anaemia. Diets were calorie deficit and hence may risk the participant to malnutrition.
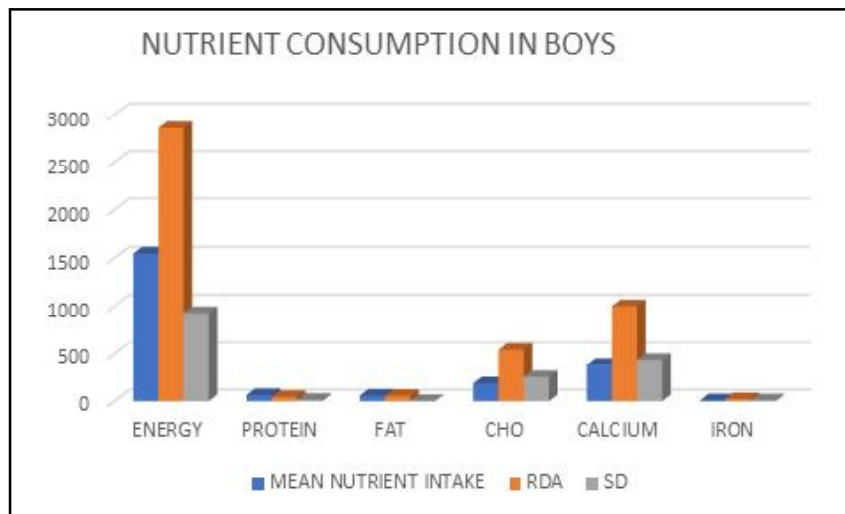

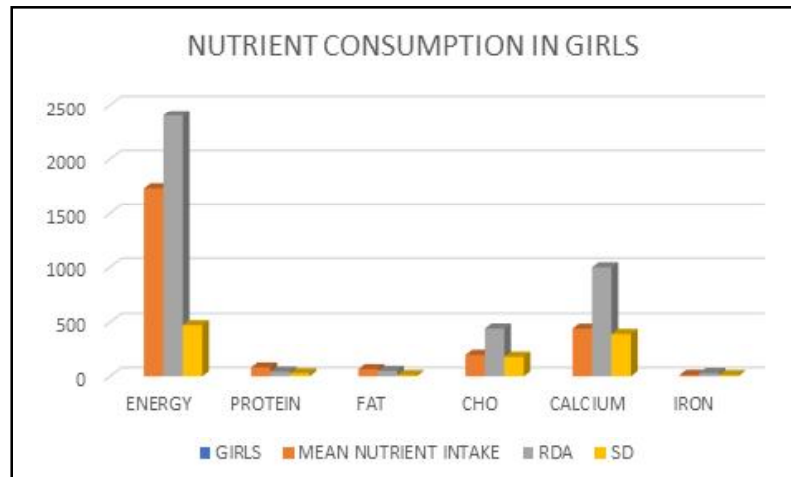Fig. 1. Nutrient consumption of Boys

Fig. 2. Nutrient consumption of Girls

Adolescent is an age group where many physiological, psychological changes occur which demands for sound nutrition. Poor diet quality and both macro and micro nutrient deficiency can have an impact in overall growth of adolescents and put them at risk of malnutrition. Early detection helps in prevention. Early detection and necessary intervention can be helpful from progression into health- related issues. In case of the present study the adolescent children hail from a low socio-economic background and associated poor nutrition which could not be covered by the provisions given at residential schools. Therefore, vigorous modifications in terms of inclusion of all five food groups along with nutrient supplementation helps to recuperate from the earlier pre-existing deficiencies.

References :

1. Assessment of nutritional status and dietary habits of undergraduate students from well to do families in Hyderabad city, India.

2. Prabhakaran, S. (2003). *Indian J. Nutrn. Dietet., 40 :* 274-279.

3. Richard Wahl (1999) *nutrition in the adolescent, slack journals*. Available at: https://journals.healio.com/doi/epdf/10.3928/0090-4481-19990201-07.

4. Shetty, P. S. and W. P. T. James, (1994). Body Mass Index : a measure of chronic energy deficiency in adults. Food and Agriculture Organization, Geneva.

5. Weir cb, jan a. Bmi classification percentile and cut off points. [updated 2023 jun 26]. In: statpearls [internet]. Treasure island (fl): statpearls publishing; 2024 jan-. Available from: https://www.ncbi.nlm.nih.gov/books/nbk541070/.

6. World Health Organization. (n.d.). *Adolescent health*. World Health Organization. https://www.who.int/health-topics/adolescent-health/

7. Yattinamani, N., and A. Balamatti, (2015). *Life, 12*(2): 167-171.