Original Article

Assessment of Nutrients Consumption among Adolescent Girls at a Field Practicing Area of a Medical College

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ABSTRACT

Introduction: Poor nutrition or low intake of major nutrients like protein, vitamin C, iron, and energy is a vast challenge among adolescents. Very few girls take amount of nutrients as per the standards i.e. recommended daily allowance. It is mainly due to lack of awareness, eating practices, and sociocultural factors of family. Hence, the study was designed to improve nutrients intake and to determine the post intervention change in nutrients intake of adolescent girls.

Methodology: Baseline level of daily nutrients intake was assessed using food frequency questionnaire and "Diet Soft" software. Intensive nutrition and health education was imparted weekly for a period of six months among 123 adolescent girls of randomly selected Anganwadi centre and compared with control group.

Results: Mean consumption of nutrients increased from 65% to 76% of recommended daily allowance for calorie, from 67% to 79% for protein, from 65% to 73% for iron and from 57% to 67% for vitamin C after intervention. Mean protein consumption in intervention group increased significantly from 36.26 gm to 38.48 gm**.**

Conclusion: Mean energy and protein consumption increased significantly from 1644 to 1811 kilocalories and from 36.26 to 38.48 gm respectively. There was a significant improvement in iron and vitamin C intake also.

INTRODUCTION

Poor nutrition or low intake of major nutrients like protein, vitamin C, iron, and energy is a vast challenge among adolescents. It was observed that very few girls take amount of nutrients as per the standards i.e. recommended daily allowance (RDA).[1] Growth rate during adolescence is very rapid and an individual acquires 35% of adult weight and 11-18% of adult height.[2] This period provides a second opportunity for girls to attain 'catch up growth' and break the intergenerational cycle of malnutrition provided there is a significant increase in their nutrient intake.[3] Majority of adolescent girls in India enter into married life with subsequent frequent pregnancies during adolescence. Poor nutrition during this phase leads to low birth weight babies and poor maternal health. Lack of awareness, eating practices, socio-cultural factors of family, poor compliance to "poshahar" (food supplements) supplied free of cost at Aanganwadis are some of the crucial factors responsible for poor nutrition.[4] Hence, an intervention to improve nutrients intake was done so as to increase the compliance of intake of "poshahar" and iron folic acid (IFA) tablets. The aim of the study was to assess differences in average intake of energy, protein, iron, and vitamin C among adolescent girls before and after intervention in both the groups.

METHODS

This community based interventional study was carried out in the field practice area of Rural Health Training Centre (RHTC), Naila, Department of Community Medicine of SMS Medical College, Jaipur (Rajasthan). Community based intervention was done for a period of six months. One Anganwadi Center (AWC 3) was randomly selected from 27 AWCs of RHTC Naila for intervention using sealed envelope method and the AWC

Table 1: Standardisation of amount of food consumed

	Chapati size (gm)	Cup size (ml)	Plate size (gm)	Katori size (ml)	Fruit size (gm)
Small	20	100	50	100	50
Small-Medium	30	150	–	–	–
Medium	40	200	75	150	100
Medium-Large	50	250	–	–	–
Large	60	300	100	200	150

(AWC 1) just geographically adjacent was considered for control group. Adjacent AWCs were taken so that all confounding factors like socioeconomic status, dietary patterns, education of parents, and school going status of adolescent girls were matched as much as possible. There were 88 eligible unmarried adolescent girls of 10-18 years age in control group (group C) and 123 in the intervention group (group I).

A predesigned pretested schedule was used for data collection. Data were collected from AWC's registers, focus group discussions with adolescent girls and their mothers, and ASHA. Food frequency questionnaire (FFQ) modified for quantitative assessment of food intake was used for quantification of food items of diet. "Diet Soft" software was used for assessment of nutrients in diet. Electronic weighing machine was used for weighing raw food material. Standardized 'katori, cup, spoon, plate' were used for calculating amount of food consumed. (Table 1).

Raw food stuff used for cooking the day's meal for the family was measured. Standardization of exact amount of food consumed by adolescent girls was done in every family. For standardization of the chapatti: the amount of dry flour used for making chapatti was weighed. It was observed that with 20, 30, 40, 50, 60 grams of dry wheat flour, the weight of readymade chapatti was of 28, 40.24, 53.43, 60.42, 70.03 grams respectively. For standardization of pulses: 200 grams of dry pulses was cooked with water and the number of katories of prepared dal was counted. The number of katories of dal consumed by adolescent girl was noted. For example, if 200 grams of dry dal makes 10 "katories" of prepared dal. (one "katori" is equal to 20 gram dry pulses) and if a girl takes 2 katori of cooked dal a day then she consumes 40 grams dry pulses a day. For standardization of the amount of other vegetable (lady finger, bottle gourd); how many grams of vegetable was cooked and how many persons consumed it was noted. If family added some other vegetables/ghee/oil/garlic while preparing the dish (dal or vegetables), amount of that was also inquired and portion consumed by girl was calculated. Similar calculation was done for other vegetables too. Nutritive value of exact food material consumed by adolescent girls was calculated by "Diet Soft" software.

Semi structured interviews with ASHA and ANM, focus group discussions with eligible adolescent girls and their mothers separately, and semi structured interview of parents and grandparents were done by the investigator. Investigator visited AWC-3 weekly; ASHA was intimated before every visit to ensure optimum presence of adolescents at Anganwadi centre for health education and feedback. They were motivated and pursued at family level also by home visits. During AWC sessions group discussion were conducted with a focus on a) details of locally available food item, b) food items that hinder and accentuate iron and other nutrient's absorption, and c) food hygiene. Peer counselors were selected through observation during first interaction and their willingness, they were asked to meet assigned girls on Thursdays. A total of 72 houses were included in the study in AWC-3 and each one of them was visited at least thrice: first visit for baseline data collection, second visit for getting family member's especially mother's support for compliance by sharing relevant information, and third visit at the end of six months for end line dietary assessment. The baseline data regarding awareness about anemia of girl, food consumed, cooking and eating practices, general socio demographic profile, personal hygiene practices, and awareness were collected and blood samples were obtained. The initial diet was assessed using food frequency questionnaire. Anganwadi workers and ASHAs of the selected AWC were contacted and a stock of the

activities done by them for girls were recorded e.g. number of adolescent girls registered with them, iron folic acid (IFA) distributed and "Kishori Sammelan" held. The status of "poshahar" and IFA distribution was noted. Linkages between AWC and sub center was evaluated in terms of health check-ups and health education sessions with girls done by ANM.

Situational analysis of anganwadi activities regarding nutrition of adolescent girls was done. Though a register was maintained at both the centers for the adolescent girls but only 13 girls were registered with AWC-3 and 10 with AWC-1. ASHA of intervention group was facilitated by increasing her knowledge through continuous interactions with senior faculty, ANM, the investigator and by using pamphlets and pictures prior to the intervention. She was also apprised of good communication skills like respecting local customs and approaching correction of wrong practices through appreciating right ones first and showing pamphlets as proof. Adolescent girls and their parents especially mothers were informed about consequences of inadequate nutrient intake, how much and what to eat, how to rectify wrong cooking practices, improve food choices within their resources, wash hands before cooking and eating food, after filling the schedule. It was impressed upon them that more nutritious diet should be given to them during adolescent period specially so during menstrual days for energy and health. 'Poshahar' was tasted by senior faculty members, ASHA, the investigator and few of the girls to impress upon its palatability. They were told that each packet not only contains good nutrients but also has a cost to the government.

RESULTS

Baseline agewise average nutrient intake of adolescent girls in both groups were comparable (Table 2). Majority of girls were not taking adequate nutrients as per RDA. The mean energy and protein consumption in intervention group increased significantly after intervention. Median consumption of nutrients increased from 65% to 76% of RDA for calorie, from 67% to 79% for protein, from 65% to 73% for iron and from 57% to 67% for vitamin C after intervention (Table 3).

Table 2: Baseline agewise average nutrient intake by adolescent girls

Age Groups	Control Mean (SD)	Intervention Mean (SD)	Difference	t value	p value
Energy (kcal)					
10-12yr	1636 (284)	1667 (273)	31	0.453	0.652
13-15yr	1708 (307)	1625 (258)	83	1.177	0.243
16-19yr	1778 (238)	1702 (264)	76	1.274	0.207
Protein (gm)					
10-12yr	27 (8.9)	31 (9.1)	4	1.816	0.074
13-15yr	34 (7.3)	36 (8.8)	2	1.041	0.301
16-19yr	43 (9.6)	41 (12)	2	0.780	0.438
Iron (mg)					
10-12yr	19.45 (3.69)	17.98 (3.97)	1.47	1.556	0.125
13-15yr	18.27 (4.39)	17.01 (3.31)	1.26	1.381	0.172
16-19yr	16.93 (5.68)	16.80 (4.78)	0.13	0.105	0917
Vitamin C (mg)					
10-12yr	33.5 (11.1)	35.7 (19.3)	2.2	0.549	0.585
13-15yr	27.8 (12.6)	29.3 (15.7)	1.5	0.421	0.675
16-19yr	31.3 (17.9)	33.7 (20.4)	2.4	0.521	0.604

Table 3: Change in consumption of nutrients (as % of RDA)

Nutrient	Control group		Intervention group	
	Before	After	Before	After
Energy				
Median	67 %	68 %	65 %	76%
Interquartile range	59–75	59–78	53–74	66–89
Range	43–102	43–106	44–106	53–113
Protein				
Median	69%	70 %	67 %	79 %
Interquartile range	56–82	54–88	59–86	63–98
Range	47–93	48–92	40–109	56–122
Iron				
Median	66 %	69 %	65 %	73 %
Interquartile range	52–88	52–96	52–70	61– 83
Range	44–97	44–92	41–108	51–101
Vitamin C				
Median	60 %	70 %	57 %	67 %
Interquartile range	52 –74	52– 80	45– 80	56– 89
Range	45–111	45–155	42–125	45–130

Table 4: Effect of intervention on energy consumption by adolescent girls

Groups	Mean (Kcal)	SD	SEM	Difference (SEM Dif.)	CI for Difference	p value df=209
			Baseline values			
Group	1644	265.80	23.97	– 62	-27.9 to 153.1	p = 0.174
Group C	1706	400.90	42.73	(45.91)		t =1.364
			After intervention			
Group I	1811	245.7	22.15	93.62	10.52 to 182.7	p = 0.033
Group C	1717	386.3	41.18	(43.57)		t =2.149
			Change due to intervention			
Group I	167	94.75	8.54	156.2 (SEM	134.8 to 177.7	p = 0.000
Group C	11	44.8	4.77	Dif. 10.9)		t =14.355

I - intervention group (n = 123) ; C - control group (n = 88)

Although there was increase of 167 in mean calorie consumption after intervention in intervention group but actual effect of intervention was only 156 (Table 4), as there was an increase of 11 in mean calorie consumption by control group also. Mean daily protein consumption in intervention group increased significantly from 36.26 gm to 38.49 gm. Although there was 2.22 gm rise in mean protein consumption in intervention group but actual effect of intervention was only 1.73 gm, as there was an increase of 0.49 gm in mean protein consumption by control group also (Table 5). Over the period, difference observed was significantly more in intervention group. Half of the adolescent girls started taking IFA and "poshahar" in the first week, 18 (14 %) did not start by second week and, 1 (0.008 %) till third week and by fourth week there was not a single girl who had not started. On an

Table 5: Effect of intervention on protein consumption by adolescent girls in study groups

Groups	Mean (gm)	SD	SEM	Difference (SEM Dif.)	95% CI for Difference	p value
			Status at baseline			
Group I	36.26	8.58	0.77	1.27 (1.2)	–1.15 to 3.69	p = 0.302
Group C	34.99	9.90	0.97			
			Status after intervention			
Group I	38.48	8.27	0.75	3.0 (1.2)	0.64 to 5.3	p = 0.013
Group C	35.48	8.98	0.96			
			Actual difference due to intervention			
Group I	2.22	3.67	0.33	1.73 (0.45)	0.84 to 2.62	p = 0.000
Group C	0.49	2.49	0.27			

I - intervention group (n = 123) ; C - control group (n = 88)

average a girl took 19.4 ±2.08 tablets of IFA. Overall 80.83% compliance to IFA was observed. 36 (29 %) of adolescent girls took IFA tablets for ≥ 21 week i.e. ≥ 87.5% compliance while 107 (87%) took IFA tablets for ≥18 weeks i.e. approximately ≥ 75% compliance. Proportion for compliance was calculated from 24 weeks as there was no supply for two weeks. Average number of meetings by either ASHA or peer counselor or the investigator per girl was 18.89 (+/- 4.18) times.

DISCUSSION

The baseline median daily intake of energy, protein, iron, and vitamin C was 65%, 67%, 65%, and 57% respectively of RDA. It increased to 76%, 79%, 73%, and 67% respectively after six months of multipronged approach. Earlier in the absence of awareness regarding importance of poshahar, the distributed "poshahar" was fed to goats for getting more milk by girls. The scheduled monthly “Kishori divas” was not conducted at all in last six months in both the AWCs. The attitude of ASHAs of both the centers was positive; they were ready to work but said they were not told what to do exactly. ANM from PHC was not visiting them while ANM from RHTC used to come on Mother and Child Health Nutrition (MCHN) days, activity other than immunization was not done on that day too. Inspite of training, the level of knowledge about consumption of adequate quantity of nutrients and consequences of poor nutrition was very low. Baseline energy consumption in intervention group of our study ranged from 44 to 106% of RDA which changed to 53 to 113%.

Anuradha Goyle and Ira Yanendra[1] observed mean energy intakes of the subjects in the range of 55% - 56% of the RDAs. The bulk of the energy intake was fulfilled by the cereal intake. The mean protein intake of the subjects was also low and was about 56%-61% of the RDAs while in the present study it was in the range of 40%-109% at baseline in intervention group which improved to 56% to 122%. Baseline intake of iron as percentage of RDA, ranged from 41% -108% that improved to 51%-101% of RDA. The average energy intake of girls was 1644 ± 265 kcal/ day, protein 36.26 ± 8.58 gm/ day, iron 17.33 ± 4.02 mg/ day, vitamin C 32.89 ± 18.45 mg/ day, very similar to R. Parimalavalli and M. Sangeetha[5] who also stated lower than RDA intake for mean energy, protein, iron and vitamin C in their study i.e. 2060 Kcal, 63 gm protein, 17.8 mg iron, and 29.1 mg vitamin C respectively. Ahmed F[6] et al study stated that mean energy intake was 1465 kcal/day, iron 10 mg/day, protein 48.98 gm/day. CH Maliye[7] et al revealed that the calorie intake of the adolescent girl was less than RDA for their age. The average energy intake was 1239.6±176.4 kcal per day. Majority of adolescent girls (82.5%) had calorie intake less than 1400 kcal. 7.5 % girls had calorie intake less than 1000 kcal. The average protein intake was 39.5±7 gm/day. The average iron intake was 13.2±2.5 mg/day. Malhotra A and Passi SJ [8] stated that 49% of subject's energy intake was less than 75% of RDA and iron intake was 84% of RDA.

In nutshell, it was a multiprong approach, a mix of personalized health education, supportive supervision, facilitation in supply, and capacity enhancement of the worker, strengthening links between ASHA and ANM, using community persons to help each other for better

compliance which worked.

CONCLUSION

The baseline median daily intake of energy, protein, iron, and vitamin C was much lower than the recommended daily allowances. Mean energy consumption and mean protein consumption in intervention group increased significantly. A multipronged approach to involve peer group, family member, and strengthening Anganwadi services by motivating and facilitative supervision of field workers significantly increased the daily intake of nutrients.

REFERENCES

1. Anuradha Goyle and Ira Yanendra. Nutrient Intakes of Young Girls Studying in a Government School in Jaipur City. J Hum Ecol 2009; 25(2): 127-32.
2. Tanner JM. Foetus into man: Physical growth from conception to maturity. New York: Open Book Publishing Limited, 1978; 22-36.
3. WHO. Women of South East Asia a health profile. Geneva: World Health Organization, 2000; 105-8.
4. National Adolescent Girl Scheme. New Delhi: Government of India, Ministry of Human Resource Development, Department of Women and Child Development, 1997.
5. R. Parimalavalli and M Sangeetha. Anthropometric measurements and nutrient intake of adolescent girls Anthropologist 2011; 13(2): 111-15.
6. Ahmed F, Zareen M, Khan M, Banu C, Haq M and Jackson A et al. Dietary pattern, nutrient intake and growth of adolescent school Girls in urban Bangladesh, Institute of Nutrition and Food Sciences, and Institute of Education and Research, University of Dhaka, Public Health Nutrition 1998;1(2):83-92.
7. CH Maliye, PR Deshmukh, SS gupta, S Kaur, AM Mehendale, BS Garg et al. Nutrient intake among rural adolescent girls of wardha. IJCM 2010; 35:3.
8. Malhotra A, Passi SJ. Diet quality and nutritional status of rural adolescent girl beneficiaries of ICDS in north India. Asia Pac J Clin Nutr 2007;16:suppl1:8-16.

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