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Impact of Nutrition Education on Nutrient Adequacy of Adolescent Girls

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ABSTRACT Sixty adolescent girls in the age group of 13-19 years were selected randomly from government school of village Shousha district Solan, Himachal Pradesh and surveyed for their nutrient adequacy by 24 hr. recall method for three consecutive days using standardized containers. Nutrition education was imparted to the subjects after assessing their basic nutrition knowledge. Nutrition education improved their mean nutition knowledge scores significantly ($P \leq 0.01$) from 11.17 ± 1.42 to 19.16 ± 1.8. Significant increase in average daily intake of all the nutrients was found among all the adolescent subjects. The average contribution of carbohydrate, protein and fat to total energy also increased after imparting nutrition education. The intake of vitamins and minerals also increased after imparting nutrition education significantly except for vitamin B_{12}. Thus, nutrition education is an effective measure to bring about the favorable and significant change in adolescent nutrient intake.

INTRODUCTION

Adolescence is a state or process of growing up from puberty to maturity. Adolescent account for 1/5 of the world's population and in India they account for 22.8 per cent of the total population. Adolescents are tomorrow's adult. Adolescent growth and development is closely linked to the diet they receive during childhood and adolescence. Adolescents may represent a window of opportunity to prepare nutritionally for a healthy adult life. It may also be a timely period to shape and consolidate healthy eating and life style behaviors, thereby preventing or postponing the onset of nutrition related chronic diseases in adulthood. However, eating patterns are frequently erratic in adolescents, and this may be a common factor of nutritional risk. Eating disturbances and disorders have become a leading chronic illness among adolescent girls. Number of adolescent in India particularly girls live under suboptimal conditions marked by poor nutritional status and high level of morbidity and mortality. The next generation of our country will be effected if adolescent girls who are would be mothers would have ill health and nutritional status. Keeping in view, the importance of adolescent period in human life and nutritional problems of adolescent girls , the present study has been elucidated to see the impact of nutrition education on nutrient adequacy of adolescent girls.

MATERIALS AND METHODS

Selection of the Subjects: Sixty adolescent girls between 13-19 yrs.old, studying in standards viii, ix and x were selected randomly from government school of village Shousha district Solan, Himachal Pradesh.

General Information: Information about age, qualification, caste and family pattern were collected through interview method.

Nutrition Knowledge: For adjudging existing level of nutrition knowledge, a questionnaire containing list of questions pertaining to food beliefs, fads and fallacies; as well as constituents of balanced diet; functions and requirement of food, nutrients along with cooking practices to improve nutritive value of food through germination and fermentation; food hygiene and sanitation was supplied to each subjects for filling before imparting nutrition education. For evaluating the level of nutrition knowledge one score was awarded for right and zero for wrong answer of each question.

Nutrition Education: After adjudging the level of nutrition knowledge of the subjects, nutrition education was imparted to all of the subjects in school classrooms once a week, for the period of three months through group contacts and lecture cum discussion method using charts, leaflets, posters and demonstrations. The topics covered for imparting nutri-

tion education were functions of food; balanced diet; nutrient - their functions and requirements. In addition, cooking practices to improve nutritive value of food through germination and fermentation, food hygiene and sanitation etc were also covered.

Gain in Nutrition Knowledge Scores: After imparting nutrition education**,** above developed questionnaire was again given to all the subjects for filling to adjudge the gain in level of nutrition knowledge of each subject. For evaluating the level of nutrition knowledge one score was awarded for right and zero for wrong answer of each question. Gain in nutrition knowledge and quantum of improvement was calculated as follows:

Gain in Nutrition Knowledge = Score in Post-test - Score in Pre-test.

Quantum of Improvement = Post test score / Pre test score.

Dietary History: Information related to dietary habits were collected by questionnaire cum interview method. Dietary habits included the questions regarding nature of diet consumed, number of meals taken and skipped and type of meal skipped. Dietary intake was adjudged by 24 hr. recall method for three consecutive days using standardized containers. The dietary intake was recorded before and after imparting nutrition education. The different food items consumed were converted into their raw equivalents, categorized into their respective food groups and average daily intake of energy, protein, carbohydrate, fat, beta carotene, thiamine, folic acid, vitamin C and B_{12} and minerals (iron, calcium) were calculated from the values per 100g of edible portion by using MSU nutriguide (Song et al.,1992).

Analysis of Data: The data obtained on food and nutrient intake was then analyzed statistically (Gupta and Saini, 1987). Mean and standard error of mean were calculated for each studied variable. Comparison of the nutrient intake before and after imparting nutrition education was done by applying paired t test of significance ($P \leq 0.01$).

RESULTS AND DISCUSSION

General Information: Of the total subjects majority (40%) belonged to the age group of 14 - 15 yrs. followed by 13-14 yrs. (33%) and 15-16 yrs (26%) (Table 1). Among all the subjects, maximum (50%) were studying in ix standard and minimum (16.66%) in x standard. Most (63.33%) of the subjects were living in joint family pattern and all of them had faith in Hinduism.

Table 1: General information of the adolescent girls

Particulars	*Adolescent girls (N=60)*	
	No	*%*
Age(years)		
13-14	20	33.00
14-15	14	40.00
15-16	16	26.00
Education		
8	20	33.00
9	30	50.00
10	10	16.66
Family Size		
Nuclear	22	36.60
Joint	38	63.00
Caste		
Hindu	60	100.00
Sikh	-	-

Dietary Habits: The effect of nutrition education is clearly visible as there was an improvement in the dietary habits of the respondents (Table 2). There was an increase in no. of girls who turned ova-tarian (from 5 to 10) as well as non vegetarian (from 6 to 10) after imparting nutrition education. Most of the subjects (20) as compared to earlier ones (7) started taking meals 3 times a day. Meal skipping was found to be common practice among most (43) of the subjects and breakfast (29) and lunch (12) were found to be most frequently missed meals. Earlier reports (Marino and King 1980; Karen et al., 1986 and Skinner et al., 1986) also showed meal skipping and breakfast and lunch were found to be most frequently missed meals. However, after imparting nutrition education, practice of meal skipping reduced (from 43 to 24). Similarly, skipping of breakfast and lunch by the respondents also reduced from 29 and 12 to 16 and 8 respectively.

Nutrition Knowledge Scores: Before impart-ing nutrition education, majority (46%) of the respondents had obtained the scores pertaining to nutrition knowledge between 10 - 15 followed by 5 - 10 (40%) and 15 - 20 (13%) (Table 3). None of the respondents were able to get the scores at the levels of 25 and above. After imparting nutrition education, most of the respondents (53.3%) were able to get higher scores from 15-20 and 13.3 per cent of the respondents were able to get the scores up to 25-30. Increase in nutrition knowledge scores after imparting nutrition education was found significant ($P \leq 0.01$).

Table 2: Dietary habits of adolescent girls before and after nutrition education

Particulars	*Before nutrition education (N=60)*		*After nutrition education (N=60)*	
	No.	*%*	*No.*	*%*
Nature of Diet				
Vegetarian	49	81.60	40	66.66
Ova tarian	5	8.30	10	16.66
Non vegetarian	6	10.00	10	16.66
No. of Meals Consumed				
2	51	85.00	38	63.33
3	7	11.60	20	33.33
4	2	3.30	2	3.33
Meals Skipped				
Yes	43	71.60	24	40.00
No	17	28.30	36	60.00
Type of Meal Skipped				
Breakfast	29	67.44	16	66.66
Lunch	12	27.90	8	33.33
Dinner	2	4.65	0	-

Table 3: Nutrition knowledge scores obtained by the subjects before and after nutrition education

Scores	*Pre-Test(T_1) before imparting nutrition education*		*Post-Test(T_2) after imparting nutrition education*	
	No.	*%*	*No.*	*%*
5-10	24	40	0	0
10-15	28	46	8	13.3
15-20	8	13	32	53.3
20-25	0	-	12	20.0
25-30	0	-	8	13.3

The statistical analysis of the data further revealed the effectiveness of the nutrition education among the respondents which was measured in terms of gaining scores (Table 4). The mean scores 11.17±1.42 obtained in pre test was increased to 19.16±1.8 after imparting nutrition education. The gain in nutrition knowledge scores was 7.99±0.38 and the quantum of improvement was 1.71 times. Findings of the present study are in concurrence with the study of Chawla (1992), who reported significant improvement in knowledge and attitude of the women of Ludhiana towards good nutrition after nutrition education and these women tried to practice the same knowledge in their day to day life. The findings of the present study are also at par with the findings of Bains et al. (1999) and Sharma and Chawla (2005) who observed highly significant gain in nutrition knowledge of 13-14 yrs old school girls after imparting nutrition education.

Table 4: Nutrition knowledge scores obtained by the subjects

Tests	*Scores*
Pre-test	11.17 ± 1.42
Post-Test	19.16 ± 1.8
Gain in Scores	7.99 ± 0.38
Quantum of Improvement	1.17 times

Value are mean ± SE

Nutrient Intake: The average daily intake of energy, protein, fat and carbohydrates was 51.3, 43.6, 92.27 and 42.35 per cent respectively of the RDA before imparting nutrition education (Table 5). However, after imparting nutrition education intake of respective nutrients increased to 59.5, 51.9, 130 and 52.2 per cent of the respective RDA. The increase in intake was found statistically significant ($P \leq 0.01$). Though the average daily intake of all the nutrients increased after imparting nutrition education still could not meet the level of RDA. These results are also in agreement with the findings of Banerjee and Biswas (1975); Jensen and Clausen (1976); Chaturvedi et al. (1997), Hettiarachchi et al. (2006) who also reported low nutrient intake by adolescents.

Table 6 presents the per cent calorie contribution of proximate principles in adolescent girls before and after imparting nutrition education. The average contribution of carbohydrate to total energy before imparting nutrition education was only 32.89 per cent and it increased to 40.54 per cent which was however still lower than the RDA (55%-65%). Dietary protein contributed only 5.51 per cent of energy which increased to 6.55 per cent after imparting nutrition education while an average intake of 10-15 per cent has been recommended. Fat contribution towards energy was 8.87 per cent and 12.49 per cent before and after imparting nutrition education respectively which was in between recommended intake. The results are also in favor with the findings of Sargant et al. (1994).

Vitamin and Mineral Intake: Before imparting nutrition education the average daily intake for beta carotene, thiamine, folic acid, vitamin B_{12}, vitamin c, iron and calcium was 31.59, 70, 85.6, 85, 201.25, 33.96 and 74.60 per cent of the RDA by the subjects respectively (Table 7). However, after imparting nutrition education intake of respective nutrients increased to 65.65, 106, 104.6, 90, 225.15, 47.25 and 84.22 per cent of corresponding RDA. The increase in intake was found statistically significant ($P \leq 0.01$) except for vitamin B_{12}. Ishigaki and Suzuki (1975); Lee (1978) and Salgado et al., (1979) reported inadequate intake of beta carotene among adolescent girls. Stepleton and Abernathy

Table 5: Daily average nutrient intake of adolescent girls before and after nutrition education

Nutrients	RDA #	Before Nutrition Education (N = 60)		After Nutrition Education (N = 60)		
		Mean actual intake	Per cent intake of RDA	Mean actual intake	Per cent intake of RDA	Paired t-value*
Energy(kcal)	2060	1058.38 ± 76.21	51.3	1225.58 ± 43.92	59.5	26.24
Protein(g)	65	28.38 ± 1.09	43.6	33.75 ± 1.05	51.9	45.42
Fat(g)	22	20.31 ± 1.54	92.27	28.6 ± 1.59	13.0	88.29
Carbohydrate(g)	400.50	169.41 ± 9.11	42.35	208.83 ± 10.09	52.2	31.52

Values are mean ± SE
Gopalan, C. (1989)
* Significant at P≤ 0.01

Table 6: Per cent calorie contribution of proximate principles in adolescent girls before and after nutrition education

Proximate principles	Before nutrition education (N=60)	After Nutrition Education (N=60)	RDA*
Carbohydrate	32.89	40.54	55-65
Protein	5.51	6.55	10-15
Fat	8.87	12.49	10-15

*Ghafoorunissa and Krishnaswamy (2002)

(1979) also reported high intake of ascorbic acid among female students. Inadequate iron intake in the present study coincides with the findings reported by Seki et al. (1991) and Thane et al. (2003). The results of the present study are also in agreement with the findings of Lee (1978) and Stapleton and Abernathy (1979) who also reported inadequate intake of calcium by the adolescent girls. The studies of Ahmed et al. (1998); Serra et al. (2006); Venkaiah et al. (2002) and Malhotra and Passi (2007) also supported the above findings.

CONCLUSION

The results of the present investigation revealed that nutrition education was effective in increasing the level of nutrition knowledge as well as nutrient intake. The diets consumed by the adolescent girls before as well as after imparting nutrition education were however, inadequate in most of the nutrients when compared to ICMR recommendations. Moreover, nutrient intake in terms of energy, protein, carbohydrate as well as all the vitamins except vitamin B_{12} and minerals increased significantly (P≤ 0.01).

Table 7: Daily average vitamin and mineral intake of adolescent girls before and after nutrition education

Nutrients	RDA #	Before Nutrition Education (N=60)		After Nutrition Education (N=60)		
		Mean actual intake	Per cent intake of RDA	Mean actual intake	Per cent intake of RDA	Pairedt t-value
Vitamins						
âcarotene(µg)	2400	758.33 ± 30.02	31.59	1575.83 ±29.48	65.65	58.3*
Thiamine(mg)	1.00	0.7 ± 1.01	70	1.01 ±14.2	106	6.8*
Folic acid(µg)	100	85.63 ± 4.71	85.6	104.61 ± 4.87	104.6	10.0*
Vitamin B_{12} (µg)	0.2-1.0	0.17 ± 0.01	85	0.18 ± 0.01	90	1.5**
Vitamin C(mg)	40	80.5 ± 4.69	201.25	90.06 ± 3.89	225.15	35.40*
Minerals						
Iron(mg)	28	9.51 ± 1.33	33.96	13.23 ± 1.54	47.25	37.1*
Calcium(mg)	500	373.13 ± 34.82	74.60	421.13 ±25.35	84.22	22.85

Values are mean ± SE
Gopalan, C. (1989)
*Significant at P≤ 0.01
** Non Significant

RECOMMENDATIONS

It is strongly recommended that nutrition education can be used as an effective measure to bring about favorable and significant changes in the dietary pattern of adolescent girls who are future mothers and who would be responsible for bringing nutritious balanced diet to their family members.

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