

Impact Assessment of Nutrition Education Programme on Nutritional Status of Adolescent Girls

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Abstract

The present study was conducted with the objective to assess impact of Nutrition Education Programme (NEP) on nutritional status of adolescent girls. Fifty girls enrolled in Kasturba Gandhi Balika Vidyalaya were selected. Study was conducted in Mangrop village of Suwana block of Bhilwara district. Different aspects of nutrition were selected i.e., food, food groups, functions of food, nutritional deficiency disorders. Food intake was calculated using 24 h recall method. Anthropometric measurements viz. height and weight were measured and Body Mass Index (BMI) was also calculated of each girl. Thinness has been assessed using the indicator BMI-for-age. Result of the study related to anthropometric measurement revealed that maximum percentage of subjects belonged to underweight, followed by ideal BMI. According to the z-score moderate malnutrition was found in 30% respondents at base line and after NEP it was found in 28% of respondent. At base line 68% of the respondents were lying in normal category, after NEP this percent was increased up to 72%. Food intake data showed that the mean nutrient intake of all the nutrients except calcium were lower than the recommended dietary allowances. Their diet was found grossly inadequate at base line in cereals, pulses, milk and milk products, green leafy vegetables, fruits, other vegetables and fats and oils, whereas adequacy for sugar was found more than Recommended Dietary Intake. The results of the study thus conclude that NEP made a significant impact in nutritional status of adolescent girls.

Keywords: Nutrition; Diet; Underweight; Food intake

Introduction

The adolescent girl still remains neither young plant that neither gets light nor water. She remains the flower that could have blossomed but didn't (Kamla Bhasin from "Our Daughter"). The word adolescence comes from the Latin word *adolescere* which means "to grow" or "grow to maturity". Adolescence is a period of transition when the individual changes physically and psychologically from a child into adult. Adolescence in contrast to puberty is not a single stage but a range of 13-18 years. The period of adolescence is accomplished by its profound changes in growth rates, body composition and marked physiological and endocrinal changes. India is the second most populous country in the world with total population of over 1081 million. Adolescents form a large section of population, about 22.5%, that is, about 225 million. They represent a window of opportunity to prepare for healthy adult life. Education of girls has been a high priority with the Government of India. In Rajasthan literacy rate is 67.06%, of which male and female literacy rate is 80.51 or 52.66% respectively. To achieve actual development of the society, both men and women need to be empowered in all the aspects. To target pockets where girls education is lagging behind, the Government of India has launched two focused interventions for girls—the National Programme for Education of Girls at Elementary Level (NPEGEL) and the Kasturba Gandhi Balika Vidyalaya (KGBV) to reach out to girls from marginalised social groups in over 3282 educationally backward blocks in the country where the female rural literacy is below the national average and the gender gap in literacy is above the national average. The importance of nutrition is nothing new. Back in 400 B.C., Hippocrates said "Let food be your medicine and medicine be your food." Today nutrition is more important than ever. Nutritional status is one of the indicators of the overall well-being of population and human resource development. India, being a country in development transition, faces the dual burden of pre-transition, lifestyle-related degenerative disease such as obesity, diabetes, hypertension, cardiovascular disease and cancer. Health is a fundamental human

right and health is central to the concept of quality of life [1]. Currently, India is in nutrition transition with 10% rural adults and 20% urban adults suffering from over nutrition, leading to an emerging double burden of malnutrition. To strengthen any nation there is need of healthy mothers. Nutritional awareness is important today in India, many young girls and women are malnourished and anaemic [2]. Due to lack of accurate information and proper guidance, adolescents are prone to various nutritional morbidities. Only healthy mothers can produce healthy citizens [3]. They do not have proper knowledge about their nutritional requirement; inadequate knowledge may cause various health problems. Adolescence is a period of rapid growth and maturation in human development after infancy. The nutritional status of adolescent girls, the 'future mothers' contributes significantly to the nutritional status of the community. It is only recently that efforts, though small, are made to include adolescent girls as beneficiaries in some of the health and nutrition intervention programs. Therefore, it is needed to educate and train these adolescent girls regarding health and nutritional awareness. The present study has been carried out with following objectives: To assess the existing nutritional status of adolescent girls enrolled in Kasturba Gandhi Balika Vidyalaya. To develop educational material for nutrition education programme. To assess the impact of nutrition education on nutritional status of the target group.

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Methodology

Fifty adolescent girls (13-18 years) enrolled in KGBV were selected for the present study. KGBV was selected because these schools are residential thus easy to approach. Study was conducted in Mangrop village of Suwana block of Bhilwara district. Different aspects of nutrition were selected for NEP i.e., food, food groups, functions of food, nutritional deficiency disorders. A structured pre tested tool was developed to assess nutritional status of adolescent girls. Questionnaire technique was selected for this purpose because the respondents were educated and could fill the questionnaire easily.

Food intake was calculated using 24 h recall method for one day. Type of food consumed was assessed and quantity of raw food was reported in grams. Percentage adequacy of food intake was assessed by balance diet for adolescent girls (13-15 and 16-17 years) recommended by NIN [4] used to analyse the percent adequacy of food intake, whereas calculation was done as follows:

$$\% \text{ Adequacy of food intake} = \frac{\text{Nutrient in take}}{\text{RDA}} \times 100$$

Nutrient intake was calculated using food composition tables (Tables 1 and 2). Mean nutrient intake for one day was compared with recommended dietary allowances (NIN) [4] and percent adequacy was calculated as follows:

$$\% \text{ Adequacy of nutrient intake} = \frac{\text{Food take}}{\text{Recommended dietary intake (RDI)}} \times 100$$

Nutritional anthropometry: Anthropometric measurements viz. height and weight were measured as per the guidelines suggested by ICMR standards. Height was measured by using a height scale nearest to 0.1 cm. A portable personal weighing scale was used to measure the weight in kilograms nearest to 0.1 kg, with ordinary casual clothing and without shoes.

Classification	BMI (kg/m ²)	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00-16.99	16.00-16.99
Mild thinness	17.00-18.49	17.00-18.49
Normal range	18.50-24.99	18.50-22.99
		23.00-24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00-29.99	25.00-27.49
		27.50-29.99
Obese	≥30.00	≥30.00
Obese class I	30.00-34.99	30.00-32.49
		32.50-34.99
Obese class II	35.00-39.99	35.00-37.49
		37.50-39.99
Obese class III	≥40.00	≥40.00

Table 1: BMI classification based on WHO.

>Median -2SD to + <1SD	Normal
Median < -2SD to > -3SD	Moderate under nutrition
<Median -3SD	Severe under nutrition
Median > + 1SD to < +3SD	Overweight
> +3SD	Obesity

Table 2: WHO, 2007 Classification BMI for age (z-score).

Body mass index: The Anthropometric measurements of the adolescent girls were used for calculating the body mass index which was expressed as ratio of weight (kg) to height in metre square.

$$\text{BMI} = \frac{\text{Weight (kg)}}{(\text{Height})^2 \text{ (m)}} \times 100$$

Further, the individuals were classified into different classes based on WHO [5].

BMI for age: Thinness has been assessed using the indicator BMI-for-age according to the z-score of WHO [5].

Different aspects of nutrition (food, food groups, functions of food, nutritional deficiency disorders) were selected after an extensive review of literature relevant and available on nutrition like school text book.

An information package was developed using selected messages and for this in depth content was collected from the relevant and available literature. For each selected aspect flash cards, slides, posters and games were developed. The content was delivered through lecturette supplemented with audio visual aids in the form of videos, charts, flashcard, folders and slides. In present study nutrition education package was delivered to the target group by the investigator who visited the school at least twice in a week for six weeks continuously. The knowledge test was administered twice i.e., before the delivery of training to know the initial knowledge and after 15 ± 2 days of completion of the training to find out retention in knowledge. After collecting data, it is necessary to analyse it with the help of statistics to arrive at proper and adequate conclusion. Frequency, percentage, means percent score, paired t-test were used to analyse general background information and knowledge of respondents before and after ±15 days of training.

Results

All the respondents (100%) were belonging to Hindu family. Majority of respondents (64%) were from Other Backward Caste (OBC) and 32% were from schedule caste. 64% adolescent girls had joint type of family structure. Majority (92%) of them were vegetarian. Only 4% were from ovo vegetarian. Their main family occupation was business, farming and laborer work. 60% of respondents had ₹ 5000-10000 as their monthly family income.

Data in Table 3 and Figure 1 reveal that at base line adequacy of milk and milk products and sugar was high in both the age groups. The adequacy of cereals in 13-15 years and 16-17 years of age group was inadequate i.e., 38.78% and 34.41% respectively. After the programme it was increased by 64.86% and 63.76% in 13-15 and 16-17 years of age group, respectively. Due to irregular intake of pulses by adolescent which is influenced by their low intake, the adequacy was lower in both the age group i.e., 39% in 13-15 and 40% in 16-17 years of age group. The adequacy of milk and milk products at base line was 83.6% in 13-15 years, while in 16-17 years of age group it was 92.85%. But after the programme the adequacy of milk and milk products was found to be lower may be because at baseline survey milk was used in sweet preparation (Kheer).

Due to rear consumption of fruits the adequacy for fruits was low in both the age groups. The consumption of sugar was much higher than the recommended dietary intake in both age groups at base line i.e., 136% in 13-15 years and 137.65% in 16-17 years of age group. There was a significant difference in the adequacy of cereals, milk and milk products, other vegetables, fats and oils, and sugar, while there was no significant difference in the adequacy of pulses in 16-17 years of age group before and after the programme.

S. No	Food groups	Age groups	RDI#	Details	Pre test	Post test	t-value
1.	Cereals	13-15	330	Mean SD SE	112.80 53.806 7.60	214.46 88.38 12.49	11.9*
		16-17	330	Mean SD SE	113.57 11.80 4.4	210.43 24.70 9.33	8.5*
2.	Pulses	13-15	60	Mean SD SE	23.40 10.94 1.55	34.66 16.03 2.26	3.8*
		16-17	75	Mean SD SE	30 - -	38.57 14.63 5.53	1.5 ^{NS}
3.	Milk and milk products	13-15	500	Mean SD SE	353 167.63 23.70	144.44 94.35 13.34	14.5*
		16-17	500	Mean SD SE	464.28 95.704 -	157.14 97.59 36.88	8.3*
4.	Other vegetables	13-15	200	Mean SD SE	24.74 13.19 1.86	62.22 31.97 4.52	7.99*
		16-17	200	Mean SD SE	29.71 7.31 2.76	58.00 26.86 10.15	2.7*
5.	Fruits	13-15	100	Mean SD SE	8.60 3.50 0.49	- - -	-
		16-17	100	Mean SD SE	10 - -	- - -	-
6.	Fats and oil	13-15	35	Mean SD SE	15.40 6.28 .888	24.88 4.51 .63	68.1*
		16-17	40	Mean SD SE	17.86 .37 .14	25.71 3.45 1.30	22.9*
7.	Sugar	13-15	25	Mean SD SE	29.60 12.15 1.71	12.86 9.03 1.27	20.5*
		16-17	25	Mean SD SE	34.42 1.622 .247	24.88 2.556 .390	20.5*

*Significant at 0.5 per, NS: Non-Significant

#Recommended Dietary Intake (RDI) given by NIN.

Table 3: Food intakes of adolescent girls N=50.

Data in Table 4 and Figure 2 reveals that protein intake in both the age groups was found inadequate i.e., 64% in 13-15 years age group and 63.47% in 16-17 years age group. Intake of fat was also inadequate in 13-15 years i.e., 8.33% while in 16-17 years it was 10.28%. The adequacy of carbohydrate in the diets of adolescent of 13-15 years and 16-17 years was 46 and 62.94% respectively while the adequacy of energy was 41.09% for 13-15 years and 45.71% for 16-17 years. Further tab reported that after the NEP adequacy of carbohydrate and energy was increased but it was also less than the recommendations.

The adequacy of calcium intake for adolescent of 13-15 years was 72.88% and for 16-17 years it was 80.11%. The iron intake of adolescent girls in 13-15 years of age group and 16-17 years of age group was 34.07 and 33.07% adequate, respectively. After the programme adequacy of iron was 44.55 and 49.11 in 13-15 years and 16-17 years. It was found that adequacy of iron was half of the RDI may be because of low inclusion of iron rich foods in daily diet. At base line the adequacy of carotene in the diets of girls was only 20.41% in 13-15 years and 22.75% in 16-17 years while after the programme it was 90% inadequate by RDI (Table 5).

Intake of ascorbic acid was in 13-15 years of age group and 16-17 years of age group was very low i.e., 28.95 and 31.7, respectively. Folate intake was very inadequate in both the age groups i.e., 1.2% in 13-15 years and 0.9% in 16-17 years only. There was no significant difference in the adequacy of folate during both the tests. The adequacy of zinc intake was 30.9% in 13-15 years and 25.83% in 16-17 years. It can be concluded from the Figure 2 that adequacy of all the nutrients (except calcium and carotene) was increased after nutrition education programme but they all were inadequate when compared to RDI (Table 6).

Data regarding anthropometric measurements showed that the mean height of adolescent girls was at base line was 1.52 m and after imparting nutrition education it was 1.53 m. The mean weight of the adolescent girls was at baseline and after NEP 36.05 and 36.46 units respectively (Table 7).

Maximum percentage of subjects belonged to (86% at baseline and 84% after NEP) underweight, followed by ideal BMI (14% at baseline and 16% after NEP). None of the subjects belonged to over-weight and obese grade category. According to the z-score of WHO (2007),

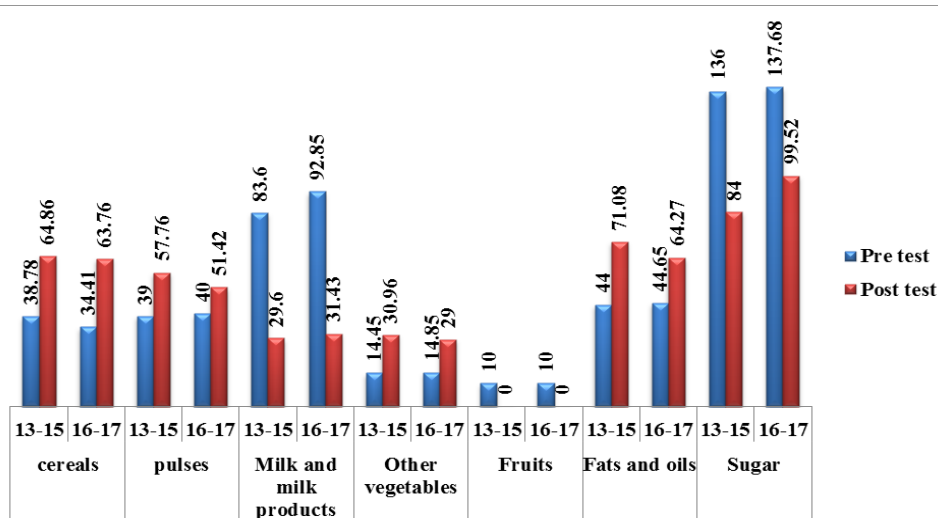


Figure 1: Percent adequacy of food intake by adolescent girls.

S. No.	Food groups	Age groups	RDA#	Details	Pre test	Post test	t-value
1.	Energy (kcal/day)	16-17	2440	Mean SD SE	1115.55 65.765 23.252	1330.7 154.822 54.738	4.018*
2.	Protein (g/day)	13-15	51.9	Mean SD SE	35.06 5.422 0.827	40.81 7.64 1.165	4.59*
		16-17	55.5	Mean SD SE	35.23 2.747 0.971	44.26 6.711 2.373	4.09*
3.	Carbohydrate (g/day)	13-15	349.5	Mean SD SE	160.79 23.673 3.61	219.98 39.732 6.059	9.438*
		16-17	366	Mean SD SE	152.39 7.953 2.812	232.97 24.092 8.518	8.487*
4.	Fat (g/day)	13-15	40	Mean SD SE	3.75 0.66 0.10	24.64 4.23 0.64	33.77*
		16-17	35	Mean SD SE	3.61 0.186 0.066	24.64 3.87 1.37	14.966*
5.	Calcium (mg/day)	13-15	800	Mean SD SE	583.05 115.134 17.558	347.9 111.17 16.95	10.95*
		16-17	800	Mean SD SE	640.91 116.455 41.173	368.41 124.457 44.002	6.511*
6..	Iron (mg/day)	13-15	27	Mean SD SE	9.21 1.631 0.249	12.04 2.502 0.382	6.97*
		16-17	26	Mean SD SE	8.61 0.488 0.172	12.77 1.039 0.367	9.343*
7.	Zinc (mg/day)	13-15	11	Mean SD SE	3.47 0.701 0.107	6.39 1.283 0.196	13.92*
		16-17	12	Mean SD SE	3.14 0.24 0.08	6.92 0.69 0.24	12.717*
8.	β Carotene (μg/day)	13-15	4800	Mean SD SE	979.83 199.71 30.455	468.74 190.935 29.117	13.57*
		16-17	4800	Mean SD SE	1092.2 209.24 73.97	491.63 201.70 71.31	9.032*
9.	Ascorbic acid (mg/day)	13-15	40	Mean SD SE	11.58 1.871 0.285	9.05 2.835 0.432	5.04*
		16-17	40	Mean SD SE	12.69 1.97 0.7	9.28 2.57 0.91	3.8*
10.	Dietary folate (μg/day)	13-15	150	Mean SD SE	1.81 0.599 0.091	2.06 0.946 0.144	1.6*
		16-17	200	Mean SD SE	1.81 0.39 0.14	2.09 0.38 0.13	1.63 ^{NS}

#Recommended Dietary Allowances (RDA), (NIN-2010)

Table 4: Mean nutrient intake of adolescents girls N=50.

Moderate malnutrition was found to be present in 30% respondents at base line and after NEP it was found in 28% of respondents. Base line survey indicated that 68% of respondents were in lying in normal category. After imparting nutrition education the% of normal category was increased up to 72% of overweight was same as baseline.

Conclusion

Diet survey has its own importance because food gap is the principal

contributor to under-nutrition in India. Nutrients intake was assessed by 24 h recall method, deficiencies of all nutrients in adolescent girls were observed. Base line survey indicated that lack of awareness, poor socio economic background, dietary inadequacy, poor quality of diet was the main factors associated with low dietary intake of these girls. But after imparting nutrition education food intake was significantly increased but it was also less than RDA. Their school menu was also found to be inadequate compare to RDI for adolescent girls.

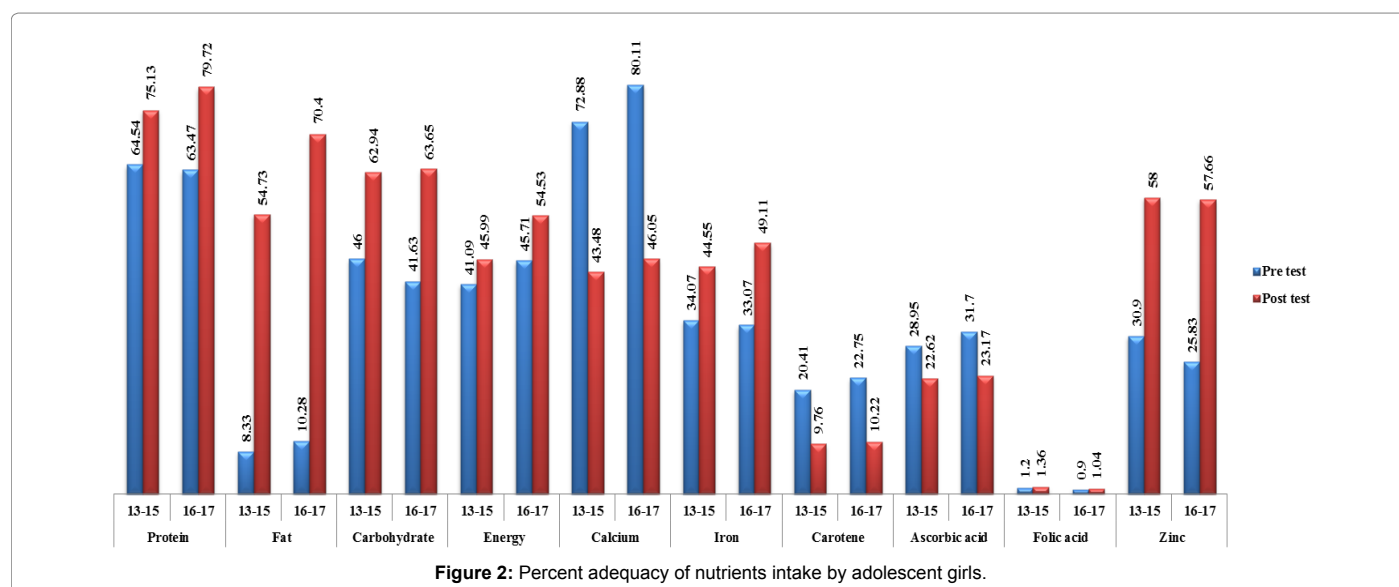


Figure 2: Percent adequacy of nutrients intake by adolescent girls.

Variables	Pre	Post	t-value
Mean height (m)	1.52	1.53	1.33 ^{NS}
Mean weight (kg)	36.05	36.46	3.2*
BMI	16.24	16.37	2.4*

NS: Non-Significant, *Significant at 0.05 per cent

Table 5: Anthropometric data of adolescent girls N=50.

BMI	Type of malnutrition	Pre test		Post test	
		f	%	f	%
<18.50	Underweight	43	86	42	82
<16.00	Severe thinness	20	40	19	38
16.00-16.99	Moderate thinness	13	26	14	28
17.00-18.49	Mild thinness	9	18	10	20
18.50-24.99	Normal range	7	14	8	16
≥25.00	Overweight	-	-	-	-
25.00-29.99	Pre-obese	-	-	-	-
≥30.00	Obese	-	-	-	-
30.00-34.99	Obese class I	-	-	-	-
35.00-39.99	Obese class II	-	-	-	-
≥40.00	Obese class III	-	-	-	-

Classification based on WHO.

Table 6: Type of malnutrition in adolescent girls N=50.

The requirement of nutrients was not adequately even after programme but the intake of energy, fat, and protein had increased after the programme. The results of the present investigation reveal that nutrition education was effective in increasing the level of nutrient intake. Further because of their curiosity in learning new things and potential learning power, gain in knowledge was high. Choudhary et al. [6] conducted a study to assess nutritional status of adolescents. Results revealed that adolescent girls had clinical nutritional deficiency diseases. Two-third of study subjects were undernourished (BMI<18.5 kg/m²), nearly one-third experiencing chronic energy deficiency grade-III (BMI<16 kg/m²). Another study was conducted by National Nutrition Monitoring Bureau [7] reported that intake of all foods, except cereals & millets and roots & tubers was below the Recommended Daily Allowance (RDA) in all ages. Consumption of protective foods such as green leafy vegetables, fruits and milk were grossly inadequate. The proportion of adolescents consuming inadequate amounts was

BMI for age		Pre test		Post test	
		f	%	f	%
According to z-score					
Severe under nutrition	<Median -3SD	0	0	0	0
Moderate	Median < -2SD to > -3SD	15	30	13	26
Normal	>Median -2SD to < +1SD	34	68	36	72
Overweight	Median > +1SD to < +3SD	1	2	1	2
Obesity	>+3SD	0	0	0	0

Classification based on WHO z-score

Table 7: Anthropometric indicators (BMI for age) N=50.

higher in case of macronutrients than that of protein, energy and total fat. More than 2/3rd of adolescents were consuming <70% of RDA for vitamin A and riboflavin. Extent of deficiency with respect to iron was higher.

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