
EFFECT OF IMPARTING NUTRITION EDUCATION ON NUTRIENT INTAKE OF FEMALES IN EARLY AND LATE ADOLESCENCE

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Abstract

Two hundred adolescent girls in the age group of 13-19 years were selected from government schools of rural and urban area from district Kurukshetra (state Haryana, country India) and surveyed for their nutrient adequacy by 24-hour recall method for three consecutive days using consistent vessels. Nutrition education was imparted to the subjects after adjudicating their elementary nutritional awareness. Nutrition education imparted to adolescent girls increased their average daily intake of calories, proteins and iron significantly. Hence, nutrition education is an effective measure to bring about the favorable and noteworthy modification in adolescent nutrient intake.

Introduction

Adolescence is a phase of change from childhood towards adulthood that needs energy rich foods with additional nutrients. It is a very energetic and lively phase of life. As this phase of life is significant because of growth and development, dietary requirements both quantitatively as well as qualitatively are of countless importance. Unbalanced diet during this age can potentially interrupt growth (Johnson et al., 1994) and place the adolescents at risk. During adolescence, nutritional deficiency has spillover effect on body and health. Many researches on nutrition education have focused on the relationship among knowledge, attitude and behavior. Nutritional knowledge is perceived as encouraging healthy eating habits hence, increase in nutritional knowledge is likely to influence eating behavior (Shepherd and G. Towler, 2007). Nutritional knowledge can impact the eating pattern and improve the nutritional status. It also improves the behavior and changes the attitude towards wrong practices of food consumption and improves the health among adolescents. Nutritional status of adolescents can be enhanced by making them conscious about their increased nutritional requirements by imparting nutrition education. Keeping this in view, the importance of adolescent phase in life and problems of adolescent girls related to nutrition, the present study has been illuminated to see the impact of imparting nutrition education on nutrient intake of adolescent girls.

Materials and Methods

Selection of the Subjects

Two hundred adolescent girls between 13-18 years old were selected from different government schools located in urban and rural areas of district Kurukshetra.

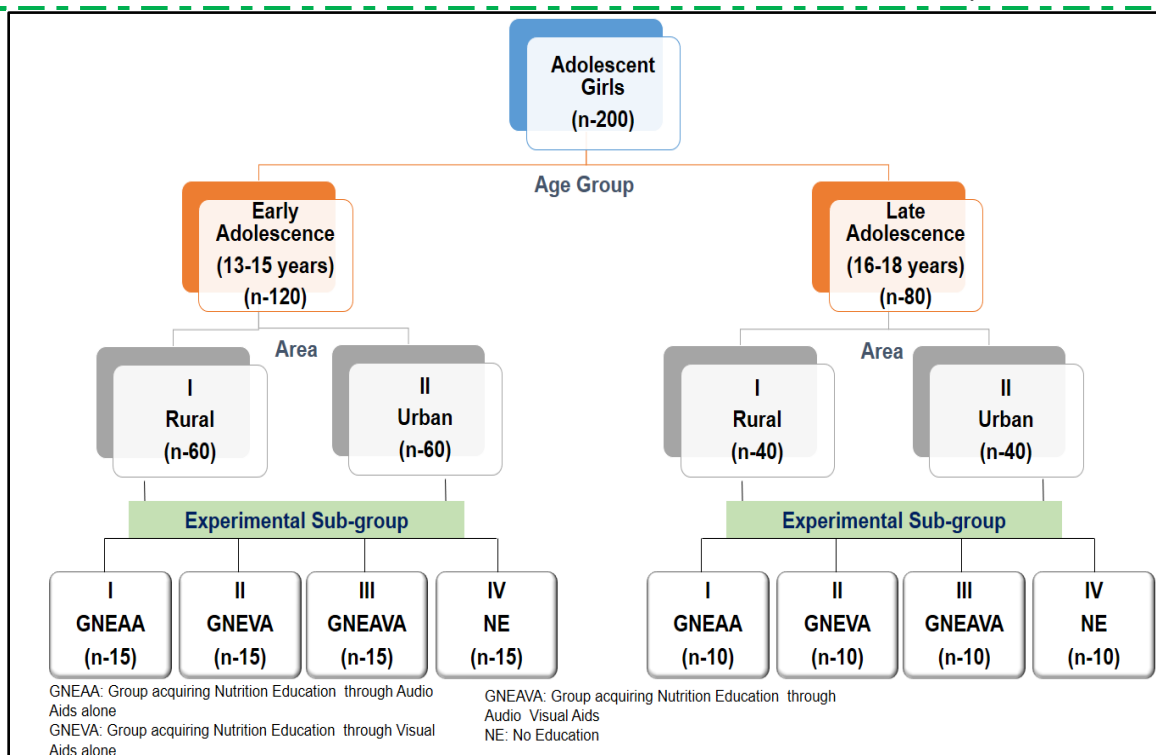


Figure 1: Experimental Plan

General Information

Information about family pattern, caste and religion and ordinal position were poised through interview method of all the subjects excluding subjects of control group.

Nutrient Intake

Information related to nutrient intake were collected and calculated by questionnaire cum interview method. Dietary intake included the questions regarding nature of diet consumed, number of meals eaten and skipped and type of meal skipped. Dietary intake was adjudicated 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 calories, proteins and iron were calculated from the values per 100g of edible portion by using MSU nutriguide (Song et al., 1992).

Nutrition Education

Nutrition education was imparted to the subjects about elements of balanced diet; roles and needs of food and its effects on body, benefits of healthy eating and hazards of eating junk foods in three experimental groups i.e. Group acquiring Nutrition Education through Audio Aids alone (GNEVA), Group acquiring Nutrition Education through Visual Aids alone (GNEVA), Group acquiring Nutrition Education through Audio -Visual Aids (GNEAVA), twice a week for the period of three months. The topics covered for imparting nutrition education were functions and importance of food, nutrition and nutrients, food groups, Rich sources of different nutrients and right cooking practices for conservation of nutrients and Cheap and locally available rich food sources of proteins and iron.

Analysis of Data

The data obtained before the start and at the end of experiment was tabularized and statistically analyzed using mean value, standard deviation, paired T test with the help of MS Excel to draw a conclusion.

Results and discussion*Table 1.1: Family Profile of Rural and Urban Adolescent Girls Selected for Imparting Nutrition Education*

Parameters	Early Adolescent n-120			Late Adolescent n-80			Grand Total (n-200)
	Rural (n-60)	Urban (n-60)	Total (n-120)	Rural (n-40)	Urban (n-40)	Total (n-80)	
a. Type of family							
Nuclear	25 (41.6)	42 (70.0)	67 (55.8)	20 (50.0)	33 (82.5)	53 (66.2)	120 (60.0)
Joint	35 (58.3)	18 (30)	53 (44.1)	20 (50.0)	07 (17.5)	27 (33.7)	80 (40)
b. Caste and religion							
Hindu	49 (81.6)	52 (86.7)	101 (84.1)	34 (85.0)	30 (72.5)	64 (80.0)	165 (82.5)
Sikh	6 (10.0)	5 (8.3)	11 (9.1)	6 (15.0)	9 (22.5)	15 (18.8)	26 (13.0)
Muslim	0 (0.0)	2 (3.3)	2 (1.6)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.0)
Others	5 (8.3)	1 (1.6)	6 (5.0)	0 (0.0)	1 (2.5)	1 (1.2)	7 (3.5)
c. Ordinal Position of Respondents in the Family:							
First	27 (45.0)	32 (53.3)	59 (49.1)	14 (35.0)	15 (37.5)	29 (36.7)	88 (44.0)
Having both older and younger siblings	19 (31.6)	12 (20.0)	31 (25.8)	14 (35.0)	12 (30)	26 (32.5)	57 (28.5)
Last	14 (23.3)	12 (20.0)	26 (21.6)	12 (30.0)	7 (17.5)	19 (23.8)	45 (22.5)

General information

- Type of Family:** Out of 200 selected subjects, the majority (60%) of them belonged to nuclear families followed by joint families (40%). The maximum subjects belonging to nuclear families were from an urban area in both early (70%) and late (82.7%) adolescence group. The trend of joint families (58.3%) was observed maximum in early adolescent subjects followed by (50%) late adolescent subjects belonging to the rural area.
- Caste and religion:** Out of all selected subjects, the maximum subjects (82.5%) from early and late adolescent period were from Hindu community. Sikh community was comprised with (13%) of subjects, whereas Muslim girls constituted only one per cent.

- c) **Ordinal position of respondents:** Data collected on the ordinal position of the selected respondents indicate that out of all (200) selected female subjects, (44%) were the first child of their families followed by the middle child (31.5%) and 22.5% were the last child of their families. In early and late adolescence group, the highest number (44%) of the subjects were the first child. The data furthered showed that in both early and late adolescence groups, the families of the subjects belonging to the urban area had the tendency of having only two children as compared to the families of the subjects belonging to rural area those were having three or more children.

Table 1.2 Calories Intake of Rural and Urban Adolescent Girls Before and After Imparting Nutrition Education

Parameters		Early Adolescence Period (n-120)				Late Adolescence Period (n-80)			
Area	Calories (Kcal) per day	GNEAA n-30	GNEVA n-30	GNEAVA n-30	Control n-30	GNEAA n-20	GNEVA n-20	GNEAVA n-20	Control n-20
Rural	Before (b)	1281.10 ±115.40	1369.82 ±74.33	1307.40 ±92.79	1361.47 ±83.78	1524.50 ±76.70	1505.20 ±82.00	1619.60 ±151.50	1483.18 ±156.83
	% RDA	54.98	58.79	56.11	58.43	62.48	61.69	66.38	60.79
	After (a)	1367.60 ±59.65	1488.60 ±113.60	1429.40 ±65.60	1363.84 ±86.44	1593.20 ±96.30	1599.00 ±90.40	1764.40 ±110.20	1462.40 ±166.90
	% RDA	58.70	63.89	61.35	58.53	65.30	65.53	72.31	59.93
	% mean change **	6.75	8.67	9.33	0.17	4.51	6.23	8.94	-1.40
	t value*	3.49*	4.68*	4.93*	0.10	2.09*	6.79*	4.07*	0.42
Urban	Before (b)	1325.40 ±177.70	1253.16 ±72.52	1452.73 ±69.09	1295.89 ±105.04	1495.73 ±46.33	1498.30 ±164.70	1490.27 ±90.40	1500.47 ±39.90
	% RDA	56.88	53.78	62.35	55.62	61.30	61.41	61.08	61.49
	After (a)	1400.30 ±67.70	1350.69 ±143.18	1568.96 ±65.72	1317.56 ±121.21	1583.27 ±57.28	1588.27 ±95.96	1606.73 ±126.50	1380.10 ±121.90
	% RDA	60.10	57.97	67.34	56.55	64.89	65.09	65.85	56.56
	% mean change **	5.65	7.78	8.00	1.67	5.85	6.00	7.81	-8.02
	t value*	1.83	3.15*	4.97*	0.59	5.13*	3.39*	3.96*	2.65*

*Significant at 5% level; **% change from mean: (a-b)/b*100

Calories Intake of Rural and Urban Adolescent Girls Before and After Imparting Nutrition Education

In Early Adolescence, before imparting nutrition education (Table 4.2) the energy intake by the subjects of subgroups i.e. GNEAA (group acquiring nutrition education through audio aids alone), GNEVA (group acquiring nutrition education through visual aids alone), GNEAVA (group acquiring nutrition education through audio-visual aids) and control (to whom no education was imparted), in rural area was 1281.1± 115.40, 1369.82±74.33, 1307.4±92.79 and 1361.47±83.78 kcal per day, respectively. The corresponding figures of subgroups belonging to urban area were 1325.4±177.7, 1452.73±69.09, 1253.16±72.52 and 1295.89±105.04 Kcal per day.

The recommended intake by ICMR is 2330 Kcal per day for early adolescent girls and ingestion of calories in all subgroups of rural and urban areas was much lower than recommendations by ICMR.

The findings related to energy intake during adolescence phase of rural and urban areas were at par with the reports given by earlier workers (Bhatia, 1996; Chandna and Bhatt, 1984; Susheela, 1992; Sethi, 1996; Karwasra, 2000).

The effectiveness of imparting nutrition education was perceived in energy consumption as an increase was observed (6.75-9.33%) in subgroups of rural area and (5.6-8%) in subgroups of urban area after imparting nutrition education.

A significant ($p < 0.05$) increase in energy intake was observed in all subgroups of rural and urban areas to whom nutrition education was imparted through different methods belonging to urban area. Whereas, non-significant increase was seen in control groups of both rural and urban areas.

In late Adolescence, Before imparting nutrition education, the intake of calories in the female subjects of all subgroups i.e. GNEAA, GNEVA, GNEAVA and control, of both rural and urban areas was 1524.5 ± 76.7 , 1619.6 ± 151.5 , 1505.2 ± 82.0 , 1483.18 ± 156.83 and 1495.73 ± 46.33 , 1490.27 ± 90.4 , 1498.3 ± 164.7 , 1500.47 ± 39.9 Kcal per day, respectively. After imparting nutrition education to subjects of all subgroups of both rural and urban areas, the changed figures for the intake of calories were 1593.2 ± 96.3 , 1764.4 ± 110.2 , 1599.0 ± 90.4 , 1462.40 ± 166.9 and 1583.27 ± 57.28 , 1606.73 ± 126.5 , 1588.27 ± 95.96 , 1380.1 ± 121.9 respectively. A marginal increase was observed after imparting nutrition education in the subjects belonging to rural area i.e. (4.50% – 8.94%) and urban area (5.6% - 7.8%). The maximum increase in the intake of calories was seen in the group GNEAVA belonging to both rural (8.94%) and urban (7.8%) areas.

Table 1.3 Proteins Intake of Rural And Urban Adolescent Girls Before and After Imparting Nutrition Education

Parameters		Early Adolescence Period (n-120)				Late Adolescence Period (n-80)			
Area	Proteins (gm) per day	GNEAA n-30	GNEVA n-30	GNEAVA n-30	Control n-30	GNEAA n-20	GNEVA n-20	GNEAVA n-20	Control n-20
Rural	Before (b)	42.10 ± 8.59	38.90 ± 8.11	38.50 ± 11.65	28.53 ± 3.53	48.67 ± 6.64	41.20 ± 4.10	45.53 ± 3.89	47.00 ± 1.44
	% RDA	81.12	74.95	74.18	54.97	87.69	74.23	82.04	84.68
	After (a)	44.60 ± 4.55	41.70 ± 5.92	41.87 ± 5.39	30.13 ± 4.52	51.50 ± 5.39	44.00 ± 5.10	49.53 ± 5.17	41.40 ± 5.61
	% RDA	85.93	80.35	80.67	58.05	92.79	79.28	89.24	74.59
	% mean change **	5.94	7.20	8.75	5.61	5.81	6.80	8.79	-11.91
	t value*	1.44	1.66	2.61*	1.04	2.22*	1.95	3.87*	1.81
Urban	Before (b)	40.62 ± 3.99	40.49 ± 7.59	41.50 ± 9.10	40.25 ± 4.24	49.10 ± 4.61	45.23 ± 1.91	46.90 ± 3.92	45.30 ± 3.52
	% RDA	78.27	78.02	79.96	77.55	88.47	81.50	84.50	81.62
	After (a)	43.59 ± 3.40	43.51 ± 4.00	45.10 ± 2.70	41.13 ± 5.44	51.87 ± 2.07	48.33 ± 4.04	51.50 ± 2.65	46.70 ± 1.99

	% RDA	83.99	83.83	86.90	79.25	93.46	87.08	92.79	84.14
	% mean change **	7.31	7.46	8.67	2.19	5.64	6.85	9.81	3.09
	t value*	4.96*	1.77	1.45	0.89	1.68	2.59*	3.07*	1.74

*Significant at 5% level; **% change from mean: (a-b)/b*100

Proteins Intake of Rural And Urban Adolescent Girls Before and After Imparting Nutrition Education

In early adolescence female subjects belonging to the rural area before imparting nutrition education, the mean intake of proteins of subgroups namely GNEAA, GNEVA, GNEAVA and control were 42.10 ± 8.59 , 38.9 ± 8.11 , 38.5 ± 11.65 , 28.53 ± 3.53 gm/day, respectively. The corresponding figure of mean intake of protein in grams per day in the subjects belonging to the urban area was 40.62 ± 3.99 , 40.49 ± 7.59 , 41.5 ± 9.10 , 40.25 ± 4.24 . There were variations in proteins intake in each subgroup of rural and urban areas. The intake of proteins in all subgroups of rural and urban areas was much lower than recommendations by ICMR.

After imparting nutrition education, a significant increase has been observed in the intake of proteins in the subjects of early adolescence period. After imparting nutrition education, mean intake of proteins in grams per day were increased to 44.60 ± 4.55 , 41.70 ± 5.92 , 41.87 ± 5.39 , 30.13 ± 4.52 gm/day and 43.59 ± 3.40 , 43.51 ± 4.0 , 45.10 ± 2.70 , 41.13 ± 5.44 in female subjects belonging to the urban area. The intake of proteins seen highest (8.75%) in the subjects of sub group GNEAVAbelonging to rural area followed by sub group GNEAVA (8.67%) from urban area.

Analysis of data further revealed that maximum proteins intake (8.75%) was noticed in the subjects belonging to rural area of GNEAVA followed by GNEAA (7.70%) and GNEVA (7.02%) and in subjects belonging to urban area the maximum protein intake was found in GNEAVA (8.67%) followed by GNEVA (7.5%) and GNEAA (6.4%). positive and significant ($p < 0.05$) impact of imparting nutrition education was seen through the method of audio-visual aids in the subjects belonging to rural area followed by urban area.

However, the intake of proteins in all subgroups of rural and urban areas after imparting nutrition education was much lower than recommendations by ICMR. The results linked with protein intake during teenage years of girls belonging to rural and urban areas were at par with the reports specified by previous researchers (Bhatia, 1996; Chandna and Bhatt, 1984; Susheela, 1992; Sethi, 1996; Karwasra, 2000).

In late adolescence female subjects, the figures for the mean intake of proteins in grams per day in all experimental groups namely GNEAA, GNEVA, GNEAVA and control group belonging to rural area was 48.67 ± 6.64 , 41.2 ± 4.10 , 45.53 ± 3.89 and 47.00 ± 1.44 respectively. In urban area these figures were 49.1 ± 4.61 , 46.9 ± 3.92 , 45.23 ± 1.91 and 45.3 ± 3.52 . After imparting nutrition education, the protein (grams per day) intake of all experimental subjects belonging to rural and urban area was increased to 51.5 ± 5.39 , 44.0 ± 5.10 , 49.53 ± 5.17 , 41.4 ± 5.61 and 51.87 ± 2.07 , 48.33 ± 4.04 , 51.5 ± 2.65 , 46.70 ± 1.99 respectively. The maximum increase in intake of proteins was seen in the sub group GNEAVA in both rural and urban area; however, the highest increase was noticed in subjects of urban area by (9.8%).

Table 1.4 Iron Intake of Rural And Urban Adolescent Girls Before and After Imparting Nutrition Education

Parameters		Early Adolescence Period (n-120)				Late Adolescence Period (n-80)			
Area	Iron (mg)	GNEAA n-30	GNEVA n-30	GNEAVA n-30	Control n-30	GNEAA n-20	GNEVA n-20	GNEAVA n-20	Control n-20
Rural	Before (b)	18.10 ±1.98	15.90 ±1.43	15.97 ±1.43	14.97 ±0.67	17.07 ±1.26	18.10 ±0.79	19.40 ±2.79	15.53 ±0.61
	% RDA	67.04	58.89	59.15	55.44	65.65	69.62	74.62	59.73
	After (a)	19.90 ±0.72	17.10 ±1.98	18.67 ±2.47	15.15 ±0.96	18.10 ±0.78	18.20 ±2.65	21.10 ±1.27	14.67 ±2.66
	% RDA	73.70	63.33	69.15	56.11	69.62	70.00	81.15	56.42
	% mean change **	9.94	7.55	16.91	1.20	6.03	0.55	8.76	-5.54
	t value*	1.56	1.53	3.22*	0.85	2.19*	1.39	2.50*	1.05
Urban	Before (b)	19.95 ±3.01	18.58 ±1.28	18.44 ±1.90	17.91 ±1.85	20.83 ±3.01	20.60 ±1.18	19.70 ±2.03	17.00 ±1.37
	% RDA	73.89	68.81	68.30	66.33	80.12	79.23	75.77	65.38
	After (a)	21.13 ±3.13	19.78 ±0.94	19.84 ±1.14	18.36 ±1.32	21.77 ±1.56	21.63 ±0.92	18.20 ±3.89	17.50 ±0.76
	% RDA	78.26	73.26	73.48	68.00	83.73	83.19	70.00	67.31
	% mean change **	5.91	6.46	7.59	2.51	4.51	5.00	7.61	2.94
	t value*	1.34	2.94*	2.67*	0.57	0.67	2.41*	1.32	0.87

*Significant at 5% level; **% change from mean: (a-b)/b*100

Iron Intake of Rural and Urban Adolescent Girls Before and After Imparting Nutrition Education

In early adolescence period, before imparting nutrition education figures for iron (mg/day) intake by female subjects of sub- groups i.e. GNEAA, GNEVA, GNEAVA and control belonging to rural and urban area were 18.10±1.98, 15.90±1.43, 15.97±1.43, 14.97±0.67 and 19.95±3.01, 18.58±1.28, 18.44±1.90, 17.91±1.85 respectively. The intake of iron among girls from rural and urban area was found very less than the recommendations specified by ICMR. After imparting nutrition education, the changed figures for iron intake were 19.9±0.72, 17.10±1.98, 18.67±2.47,

15.15±0.96, respectively, in subjects of rural area and 21.13±3.13, 19.78±0.94, 19.84±1.14, 18.36±1.32 respectively, in subjects of urban area.

Significant ($p < 0.05$) increase in the intake of iron was seen among rural and urban area girls of sub-groups to whom nutrition education was imparted. The maximum increase in the intake of iron has been observed (16.91%) in girls belonging to rural area. Though there were variations in the intake of iron among the subjects of all experimental groups belonging to rural and urban area but the intake of all these components was much less than the recommended dietary allowances. The intake of iron found more in the subjects belonging to rural area than urban area. The reason might be the availability of green leafy vegetables that are rich in iron content like amaranth leaves in their diets, green leafy vegetables were easily available at their homes at very low or without any cost. Analysis of data further revealed that the maximum increase in the iron intake (16.91%) was noticed in the subjects of sub group GNEAVA of rural area and GNEAVA (7.59%) in the subjects belonging to urban area.

In subjects of late adolescence period, before giving nutrition education the figures for the intake of calories in all experimental groups belonging to rural and urban area were 17.07±1.26, 19.7±2.03, 19.4±2.79, 15.53±0.61 mg/day and 20.83±3.01, 20.6±1.18, 18.1±0.79, 17.0±1.37mg/day. The intake of iron per day by the subjects of late adolescence period from rural and urban area was also found less than the recommended dietary allowances given by ICMR. After imparting nutrition education, a marginal increase has been observed in the intake of iron from 6.03 to 8.76% in subjects belonging to rural area and from 4.51 to 7.61% in subjects belonging to urban area.

Nevertheless, after imparting nutrition education the intake of iron among early and late adolescent girls belonging to rural and urban area was found below the recommendations given by ICMR. The conclusions associated with intake of iron during adolescence period of rural and urban areas were at par with the information given by previous researchers (Bhatia, 1996; Chandna and Bhatt, 1984; Susheela, 1992; Sethi, 1996; Karwasra, 2000).

Conclusion

The results of the present research discovered that nutrition education was effective in increasing the level of nutrient intake. The diets consumed by the adolescent girls before as well as after imparting nutrition education were however, inadequate in all these three nutrients when compared to ICMR recommendations. Moreover, nutrient intake in terms of energy, protein and iron increased significantly ($P < 0.05$).

Recommendations

It is strongly suggested that nutrition education can be used as an effective measure to bring about advantageous and noteworthy modifications in the dietary pattern of teenage girls who are future moms and who would be responsible for passing nutritious and balanced diet to their outcomes

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