# IMPACT OF DIETARY INTERVENTION PROGRAM ON NUTRITIONAL KNOWLEDGE OF ADOLESCENT GIRLS IN SRINAGAR CITY OF JAMMU AND KASHMIR

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## Introduction

Adolescence is a period of human development that is considered as critical and demanding. It is a crucial time for establishing eating habits that can have long-term effects on health. Research has shown that many adolescents struggle to understand how their current eating habits can impact their future risk of chronic diseases. Unfortunately, the prevalence of overweight status among adolescents is increasing across different racial and socioeconomic groups (Wang and Beydoun, 2007). This is concerning because obesity during adolescence is often a predictor of obesity in adulthood and is associated with an elevated risk of conditions like hyperlipidemia, insulin resistance, and type 2 diabetes. (Daniel et al., 2005). In India, there is also a significant issue with micronutrient deficiencies among adolescents, as highlighted by the Comprehensive National Nutrition Survey. A study conducted in urban schools across ten cities in India revealed that more than half of the adolescent population had deficiencies in calcium and iron, while zinc and selenium deficiencies were present in approximately 10% of the sample. Various studies conducted in India have consistently shown that adolescents make poor food choices, leading to a deviation from recommended dietary standards. For instance, a study conducted in Delhi (Chugh, 2001) found that while the diets of the subjects were adequate in certain nutrients like calcium, thiamine, riboflavin, and vitamin C, they were deficient in energy, protein, vitamin A, and fiber. Nutrition education plays a crucial role in addressing these issues, particularly in schools. It has been shown to be effective in mitigating and preventing malnutrition among vulnerable children An Indian study focusing on adolescent girls aged 13-14 demonstrated that nutrition education significantly improved their knowledge about nutrition, with posttest scores increasing from 32.4% to 77.2%. (Sucharithaetal.,2007). The most recent study in India also found that adolescents' nutrition knowledge improved significantly after nutrition sessions (Raikar, et al, 2020).

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**Objectives of the study:**

Within Kashmiri context it is important to understand the current nutritional intake and nutritional knowledge of adolescents not only to understand the current situation in Kashmiri adolescents but also to help develop future strategies to improve the dietary intake of adolescents. The present study was thus undertaken with the following objectives:

1-To assess the nutritional intake of adolescent girls of Srinagar city of J&K

2-To implement and evaluate the impact of health and nutrition education (HNE) programme on the adolescent girls.

**Methodology:**

**Study setting:** It was a cross sectional study which was conducted on adolescent girls aged 13-18 years in district, Srinagar of UT J&K, India. Respondents were taken from government and private schools of Srinagar. A pre designed and a pre tested questionnaire was used to record the information after interviewing the subjects face to face in local language. The purpose of the study was explained to the adolescent girls and informed consent was obtained from them.

**Sampling method :** Participants were selected by using three-stage sampling technique. In the first stage, four educational zones of District Srinagar (North, east, west, south) were selected, in the second stage, schools and in the third stage adolescents were recruited from the selected schools. The sample included both obese and non obese girls.

**Sample size computation:** The sample size of 400 adolescent girls was calculated by using the formula, $\textbf{“NZ}^2\,\textbf{P(1-P) / d}^2\,\textbf{(N-1) + Z}^2\,\textbf{P(1-P)”.}$ This formula takes into account the anticipated population proportion of 50.00%, absolute precision of 5.00% and confidence interval of 95.00%. Minimum sample size was thus anticipated to be 330. In order to strengthen the reliability of the results and also considering non response rate of the respondents, the final sample size was used as 430 for the present study as 430 would adequately model the entire adolescent population of Srinagar city within this age range.

**Structure of the questionnaire:** A scale devised by Kuppuswamy which is the most widely used scale was used for the present study to categorize respondents into high, middle, and low SES.

**Assessment of nutritional status:**

The height and weight of adolescent girls were assessed through anthropometric measurements, employing standardized techniques (Jeliffe et al., 1989). The subjects' Body Mass Index (BMI) was computed and depicted on the BMI-for-age growth charts to

determine their percentile ranking. Based on the BMI percentiles, an individual is categorized as obese if their percentile falls at or above the 95th percentile.

**Food and nutrient intake assessment by 24 hours recall method:** The dietary intake of adolescent girls was assessed by requesting them to remember what they had consumed in the past 24 hours. The information regarding their dietary recall was documented in a physical booklet. To assist the girls in accurately recalling the amounts of different foods, standardized cups, plates, bowls, and other utensils were utilized. The nutritional content of the foods was calculated, and these values were subsequently compared to the Recommended Dietary Allowances (RDA) for Indians.

**Implementation of nutrition education programme**

Eighty adolescent girls in the age group of 13-15 years (both obese and non obese) were randomly selected for nutrition education program. A Pre-test questionnaire was administered to assess the knowledge of the girls regarding various aspects of food and nutrition. Daily Nutritional intake was also calculated before the nutritional education program to assess the micronutrient deficiency. After assessing the level of nutritional knowledge of the sample, nutrition education program was implemented and Nutritional assessment was done again and nutritional awareness was also checked after the period of three months.

**Gain in Nutrition Knowledge Scores:** After providing nutrition education to the chosen sample, the pre-existing questionnaire was once again distributed to all participants in order to evaluate any increase in their nutritional knowledge and changes in their dietary intake. To assess their nutritional knowledge, one point was given for each correct answer and zero points for each incorrect answer. The gain and improvement in nutritional knowledge were then calculated using the following method:

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

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

**Data Analysis:** SPSS 16.0 software was utilized for the purpose of statistical analysis. The collected data was tabulated, analyzed, and interpreted in accordance with the study's objectives. To compare the obese and non-obese groups, several statistical tools including mean, standard deviation, and t-test were employed. Additionally, Chi-square was utilized as a test to determine the statistical significance. The threshold for statistical significance was set at $p < 0.05$.

**Results :**

Age wise distribution, socioeconomic status (SES) and family size of the subjects

are illustrated in Table 1. Majority of the respondents belonged to the age group of 13-16 years (62.7%). 53.4% respondents belonged to Government schools and 46.5% were from private schools. SES of the subjects was classified by Kuppuswamy scale and found that most of the adolescent girls (58.1%) were in middle class, however, SES status of obese was in upper classes and non-obese girls was in middle group of socio economic status.

Body mass index of the subjects is depicted in Table 2. It was alarming to note that among obese respondents, average BMI of majority of the girls (22%) was 27.5 and when plotted at percentile chart, they were falling at 95th, none of the obese girls were found to be falling at 85th percentile (Overweight), but were falling at either 95th or above 95th percentiles which indicates obesity among adolescents.Among non-obese, (22%) of girls had an average BMI of 18 and were falling at 25th- 50th percentile when plotted at percentile chart.

### Table 1: SOCIO DEMOGRAPHIC DISTRIBUTION OF ADOLESCENT GIRLS

| Variable | Non obese N(%) | Obese N(%) | Total N(%) |
|---|---|---|---|
| **Age( years)** | | | |
| 13-15 | 160(64 ) | 110( 61.1 ) | 270(62.7) |
| 16-18 | 90(36 ) | 70( 38.9) | 160(37.2) |
| **Type of school** | | | |
| Government | 184(73.6) | 46(26) | 230 (53.4) |
| Private | 66(26.4) | 134(74) | 200 (46.5) |
| **Standard** | | | |
| 7th, 8th | 105 (42) | 75 (41.6) | 180 (41.8) |
| 9th, 10th | 105 (42) | 75 (41.6) | 180 (41.8) |
| 11th, 12th | 40 (16) | 30 (16.6) | 70 (16.2) |
| **Socio-economic status** | | | |
| Lower class | 35 (14) | 61 (33.8) | 96(22.3) |
| Middle class | 201 (80) | 49 (27.2) | 250(58.1) |
| Upper class | 14 (5.6) | 70 (38.8) | 84(18.6) |
| **Family Size** | | | |
| Small (1-4) | 77(30.8) | 114(63.3) | 191 (44.4) |
| Medium (5 – 6) | 139 (55.6) | 49 (27.2) | 188 (43.7) |
| Large (above 7 | 34 (13.6) | 17 (9.4) | 51(11.8) |

**Table 2- BODY MASS INDEX OF THE RESPONDENTS**

| Age | Obese | | | Non Obese | | | Grand Total |
|---|---|---|---|---|---|---|---|
| | BMI(kg/m$^{2)}$) X | BMI for Age Percentiles | Total No (%) | BMI ( X ) | BMI for Age Percentiles | Total No (%) | |
| 13 | 27 | Above 95$^{th}$ | 35(19) | 18 | 25-50 | 55(22) | 90(20.9) |
| 14 | 27.5 | At 95$^{th}$ | 40(22) | 19 | At 50 | 50(20) | 90(20.9) |
| 15 | 28 | At 95th | 35(19) | 18 | 25-50 | 55(22) | 90(20.9) |
| 16 | 27.5 | At 95$^{th}$ | 40(22) | 19 | 25-50 | 50(20) | 90(20.9) |
| 17 | 27 | Above 95th | 13(10) | 19 | 25-50 | 22(10) | 35( 8.1) |
| 18 | 28 | Above 95th | 17(7) | 20 | 25-50 | 18(8.8) | 35( 8.1) |

Note:  For determining overweight and obesity for adolescents, BMI is first calculated, then BMI value is plotted on the  BMI-for-age growth charts to obtain a percentile ranking. The ranking of 85th and 95th percentiles are used as cut offs by Indian academy of Pediatrics

Distribution of adolescent girls (Table 3) on the basis of intake of different nutrients revealed that subjects intake of calories, proteins and fat was higher than the Recommended Dietary Allowances (2444.00kcal/d, 64.98g/d & 41.7g/d respectively) which got reduced to 1988.49kcal/d, 56.80g/d & 27.36g/d after the implementation of the nutrition education program. However daily mean intake of micronutrients such as iron, calcium and even fiber (24.47mg/d, 620mg/d & 22.42mg/d) was found to be less than RDA values, these values significantly got increased (21.72mg/d, 650.3mg/d, 20.4mg/d) in the post test after the intervention program. Results were found to be statistically significant (P <0.001). Vitamin C intake however got reduced from 41.69 mgs /day to 36.86/ day from pretest to post test.

Nutrition related knowledge of the subjects before and after imparting Health and Nutrition Education is illustrated in Table 4. Adolescent girls were found to be lacking diet related knowledge which was measured with the help of a pretest questionnaire Since our subjects were deficit in their nutritional and dietary knowledge, thus a need for nutrition education was felt. After imparting nutrition education, most of the girls were able to show improvement in their knowledge. Their knowledge about nutrients, various types of foods, iron rich foods, balanced diet, RDA improved significantly in the post test questionnaire.

**TABLE 3- RESPONDENTS INTAKE OF NUTRIENTS**

| Nutrients | | Pre- Intake | Post Intake | t value | p value |
|---|---|---|---|---|---|
| Calories ( K.cal/day) | Mean | 2444.00 | 1988.49 | -7.60 | <0.001 |
| | Std Deviation | 1909.55 | 553.92 | | |
| | RDA | 2330.00 | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Protein (Grams/day)** | Mean | 64.98 | 56.80 | 8.30 | <0.001 |
| | Std Deviation | 15.10 | 16.46 | | |
| | RDA | 51 | | | |
| **Fat (Grams/ day)** | | | | -14.61 | 0.00 |
| | Mean | 41.70 | 27.36 | | |
| | Std Deviation | 17.72 | 10.66 | | |
| | RDA | 40 | | | |
| **Iron (mgs/day)** | Mean | 24.47 | 21.72 | -2.81 | <0.005(S) |
| | Std Deviation | 8.33 | 8.24 | | |
| | RDA | 27 | | | |
| **Calcium (mgs /day)** | Mean | 620.08 | 650.39 | -6.14 | <0.001 |
| | Std Deviation | 279.43 | 292.41 | | |
| | RDA | 800 | | | |
| **Fiber ( g/day)** | Mean | 22.42 | 20.44 | 7.65 | <0.001 |
| | Std Deviation | 4.64 | 4.51 | | |
| | RDA | 25 | | | |
| **Vitamin C ( mgs /day)** | | | | 0.63 | 0.52 |
| | Mean | 41.69 | 36.86 | | |
| | Std Deviation | 25.43 | 22.05 | | |
| | RDA | 40 | | | |

Nutrition knowledge scores were also calculated before and after imparting Health and nutrition education to Adolescent girls (Table 5). As evident, 38.8% of the respondents were able to get higher scores of 10-15 which had significantly improved from the previous scores. The statistical analysis of data further revealed the effectiveness of the nutrition education among the respondents which was measured in terms of gaining scores. The mean scores of 4.93± 2.5 obtained in pre test was increased to 9.18 ± 2.31 after imparting nutrition education. The gain in nutrition knowledge scores was 4.24 ± 2.43 and the quantum of improvement was 2.29 times.

**TABLE - 4:  NUTRITIONAL KNOWLEDGE OF THE ADOLESCENT GIRLS BEFORE AND AFTER IMPARTING HNE (HEALTH AND NUTRITION EDUCATION)**

| Nutritional Knowledge | Knowledge in pre test N (%) | Knowledge in post test N (%) | p |
|---|---|---|---|
| **Foods to be avoided and reasons for avoiding** Ghee/ Butter/ sweets/ junk foods | 41 (52) | 66 (82) | <0.05 |
| **Classification Of Nutrients** Macro nutrients ( Carbohydrates, Protein & Fat, And Micronutrients ( Vitamins and Minerals) | 24 (30) | 69 (86) | <0.05 |

| | | | |
|---|---|---|---|
| ***Body building foods***<br>Eggs/ Meat/chicken/Pulses | 23 (29) | 66 (83) | <0.05 |
| ***Energy giving foods***<br>Cereals/ sugar/ potato | 24 (30) | 68 (85) | <0.05 |
| ***Benefits of fiber***<br>Prevents and controls diseases, Provides satiety | 10 (12) | 50 (63) | <0.0001 |
| ***Iron rich Foods***<br>Spinach/ Liver/ meat | 25(31) | 70(88%) | <0.05 |
| ***Junk Foods***<br>Soft drinks/ pizza/Burger | 45(56) | 71(81) | <0.05 |
| ***Balanced Diet*** | 40 ( 50 ) | 70 (88) | <0.05 |
| ***Food groups included in a balanced diet*** | 34 (42) | 67 (84) | <0.05 |
| ***Concept of RDA*** | 15 (18) | 60 (75) | <0.0001 |
| ***Mineral and vitamin rich foods***<br>Fruits<br>Vegetables | 25(31)<br>24(30) | 70(88)<br>70(88) | <0.0001 |

**TABLE 5: NUTRITION KNOWLEDGE SCORES OBTAINED BY THE SUBJECTS BEFORE AND AFTER NUTRITION EDUCATION**

| Scores | Pre-test (T1), before imparting nutrition education | | Post -test (T1), after imparting nutrition education | |
|---|---|---|---|---|
| | No | % | No | % |
| 0-5 | 48 | 60.0 | 11 | 13.8 |
| 5-10 | 31 | 38.8 | 38 | 47.5 |
| 10-15 | 1 | 1.2 | 31 | 38.8 |
| Total | 80 | 100.0 | 80 | 100.0. |
| **Nutrition knowledge scores obtained by the subjects.** | | | | |
| | Mean (Std. Deviation) | | | |
| Pretest | 4.9383± 2.50672 | | | |
| Post test | 9.1852 ± 2.31900 | | | |
| Gain in Scores | 4.2469 ± 2.43172 | | | |
| Quantum of improvement | 2.29 times | | | |

**DISCUSSION:**

The present study aimed to examine the difference that a nutrition education session could make in adolescent girls knowledge of a balanced diet, the importance of various nutrients and food groups (containing macro- and micronutrients) in a daily diet, and understanding the importance of fiber and iron rich foods etc in a way that was different

from their regular classroom teaching, utilizing beautiful posters, flipcharts and demonstration.

Adolescence is a critical phase of development that bridges the gap between childhood and adulthood. During this period, the choices and habits adolescents make, including their eating habits, can have a significant impact on their future health and well-being. (Omran and Al-Hafez, 2006). Therefore, it is essential to provide them with the necessary knowledge and skills to make informed decisions about their nutrition.

One effective way to achieve this is through nutrition education sessions. These sessions can go beyond the traditional classroom teaching methods and utilize engaging tools such as beautiful posters, flipcharts, and demonstrations. By doing so, we can capture the attention and interest of adolescent girls, making the learning experience more enjoyable and effective. (Lua and Putri, 2012).

The aim of our study was to assess the impact of a nutrition education session on adolescent girls' knowledge of a balanced diet, the importance of various nutrients and food groups, and the significance of fiber and iron-rich foods. We found that approximately 40% of the girls were able to accurately define a balanced diet, while less than half of the respondents could correctly identify different protein-rich foods. These findings are consistent with previous studies conducted in Italy and Bangladesh. (Grosso et al., 2013).

On a positive note, the girls demonstrated a good understanding of vitamin and mineral-rich foods, with 77% mentioning vegetables and 50% mentioning fruits as examples. This aligns with the findings of a study conducted in rural Bangladesh, further highlighting the importance of promoting the consumption of these nutritious foods. (Alam et al, 2010). Overall, our study emphasizes the value of nutrition education in empowering adolescent girls to make informed choices about their diet and overall health. By utilizing innovative teaching methods and engaging materials, we can enhance their knowledge and understanding of nutrition, ultimately leading to healthier lifestyles both now and in the future. similar increase in the posttest scores was observed in a study conducted in three cities of India i.e. New Delhi, Jaipur and Agra (Shah et al, 2010).

Previous research has demonstrated that interventions focused on nutrition in schools can have a significant impact on the dietary habits of children and teenagers (Wang et al, 2015). Our own study also found that the nutrition knowledge of adolescent girls improved significantly after they received health and nutrition education. The effectiveness of nutrition education in enhancing nutrition knowledge has also been supported by other studies conducted in India (Gupta and Kochar, 2008).

In comparison to the recommended dietary allowances (RDA), it was discovered that

the diets of obese individuals were highly unbalanced. While the diets of most obese girls contained sufficient calories, protein, fat, and vitamin C, they were lacking in essential micronutrients such as iron and calcium. Interestingly, the protein intake of all the girls was quite high, possibly due to their consumption of protein-rich foods like meat, fish, chicken, and eggs, as the majority of girls in our study were non-vegetarians. However, the intake of iron-rich and calcium-rich foods by adolescent girls was found to be inadequate. Additionally, obese girls consumed more fat and calories, as their consumption of junk food was higher compared to non-obese individuals..

## CONCLUSION:

In this study, we have shown that adolescent girls did not have healthy eating habits. The knowledge about food and nutrition among school-going girls was found to be inadequate. The implementation of nutrition sessions using different educational materials proved to be a valuable method for enhancing the nutrition knowledge of these students. Therefore, it is crucial for schools to incorporate nutrition-oriented sessions and practical demonstrations to significantly improve the food and nutrition knowledge of adolescents.

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