

DIETARY PATTERN AND NUTRIENT INTAKE OF OVERWEIGHT AND NORMAL WEIGHT ADOLESCENT GIRLS – A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: The objective of the study was to evaluate and compare the dietary pattern and nutrient intake of overweight and normal weight adolescent girls.

Methods: A cross-sectional study was conducted among 200 adolescent girls aged 18–22 years. Information regarding demographic profile and the dietary pattern was obtained using a questionnaire. Anthropometric measurements such as height, body weight, and waist circumference were measured and body fat percentage was estimated. Nutrient intake was calculated using 3 days dietary recall method. In addition, a nutrition education program was conducted to create an impact on the dietary habits.

Results: The study showed that majority of the subjects in both the groups was non-vegetarians. With regards to meal skipping, 76% of the overweight girls had the habit of skipping meal and breakfast was the most common meal that was skipped. There was a significant difference in the anthropometric indices and nutrient intake between normal and overweight subjects. Subjects in both the groups were fond of eating junk foods followed by inadequate intake of fruits. Nutrition education program helped them to change their dietary habits.

Conclusion: Providing nutrition education to adolescents is essential as it creates an impact on the eating habits by modifying their dietary pattern and creating awareness about the ill health effects of junk food consumption.

Keywords: Adolescent girls, Nutritional status, Nutrition education, Dietary habits.

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INTRODUCTION

The term "adolescence" is derived from the Latin verb "adolescere," which means "grow to maturity." Adolescents are considered to be a unique target group as optimal growth during this period is considered to be of prime importance in maintaining good health thereafter. In addition, transition from childhood to adolescence creates special nutritional needs for growth and development that have to be provided through proper eating habits and dietary pattern [1]. Currently, it is estimated that there are about 69.7 million adolescent girls constituting about 7.0% of the total population. Research has reported that establishing proper dietary habits in adolescence decreases the risk of morbidities such as undernutrition, being overweight or obese, and micronutrient deficiencies and also prevents the risk of developing other chronic illness such as hypertension, diabetes, and cardiovascular diseases [2].

Following undesirable or faulty eating habits such as skipping of meals, low intake of fruits and vegetables, consumption of fast foods, and eating away from home is common among adolescent girls which is associated with diet-related chronic illness [3]. Consumption of foods rich in saturated fats, refined sugar, and energy dense caloric foods are common in this age group. Popularization of these foodstuffs in this age is due to certain factors such as peer influence advertising through social and public media, socioeconomic status of household, quick preparation, great taste, and attractive appearance [4,5].

Since the dietary pattern of adolescents encounters dramatic changes, recognizing them and bringing a change in their food consumption pattern is essential in improving the health status of future adults. Although many studies reveal that some of these patterns are likely to be common among adolescent girls, very little information is available. In spite of knowing the detrimental effects of following unhealthy food habits, adolescent girls still continue to follow this food pattern because of which providing nutrition education program is essential as it helps to improve health outcomes and

foster healthy eating. Therefore, the present study was carried out among adolescents with the following objectives:

1. To assess the dietary pattern of adolescent girls.
2. To measure anthropometric indices such as height, body weight, waist circumference, and calculate body fat percentage.
3. To calculate the nutrient intake using 24 h dietary recall for 3 days and to compare with recommended dietary allowances (RDA).
4. To conduct and assess impact of nutrition education program.

METHODS

A cross-sectional study design was adopted for the study. The study protocol was reviewed and approved by the Institutional Independent Ethics Committee before the commencement of the study.

Sample selection

Two hundred college-going adolescent girls aged 18–22 years were selected using purposive sampling technique. The subjects were categorized into two groups, namely, overweight and normal adolescent girls based on body mass index (BMI) cut off as it is an age-independent anthropometric criteria [6].

Criteria for sample selection

Inclusion criteria	Exclusion criteria
Subjects willing to participate in the study	Subjects having eating disorders
Subjects should not be suffering from any illness	Subjects who are on restrictive diet

Tools for data collection

Questionnaire

A structured questionnaire was used to elicit general information regarding demographic profile such as age, educational qualification,

socioeconomic status, and dietary pattern of the subjects who participated in the study.

Anthropometric measurements

Anthropometric measurements assess the nutritional status of the individual by assessing the size, proportion, and composition of the human body. It is widely used for assessing nutritional problems and its relation with other chronic diseases. It reflects both the health and nutritional status of the population and is used as a tool for guiding public health policy.

Body weight

The weight was recorded using a portable weighing scale which was adjusted to zero error. The subjects were requested to stand erect barefoot on the weighing scale with normal light clothing, and the weight was recorded to the nearest 0.1 kg.

Height

The height of the subjects was measured using a non-flexible measuring tape. The height was measured and recorded in centimeters for each subject.

Waist circumference

The most valuable and practical indicator of fat distribution and abdominal fat is a person's waist circumference. Waist circumference was measured by placing a non-stretchable tape around the person's body, crossing just above the upper hip bones and making sure that the tape remains on a level horizontal plane on all sides. The tape was tightened slightly, but without compressing the skin and was measured to the nearest 0.1 cm.

Percentage body fat

The body fat percentage was calculated using the formula

$$\text{Body fat percentage} = (1.37 \times \text{body mass index}) - 3.467.$$

Dietary pattern and nutrient intake

Information regarding meal pattern, eating habits, and also the frequency of consumption of foods was also obtained using a questionnaire. 3 days dietary recall method was used to calculate the nutrient intake of the subjects. In this method, the subjects were asked to recollect what the foods and the beverages they had consumed for the past 3 days. The methodology adopted for the study is schematically represented in (Fig. 1).

Statistical analysis

The data obtained were coded and entered into Microsoft Excel 2010. Statistical tests such as t-test and Chi-square test were performed using Statistical Package for Social Sciences. Statistical significance was accepted at $p < 0.01$.

RESULTS

Table 1 summarizes that the subjects who participated in the study were aged between 18 and 22 years. With regard to educational qualification, 50% of the subjects were postgraduates in both the groups. It is also evident from Table 1 that around 60% of the subjects in both the groups were categorized under upper middle class. It might be proposed that subjects whose parent income is high are less likely to control their children and given greater independence, which affects the food consumption pattern of the children, leading to increased risk of overweight.

The mean height of overweight adolescent girls was 158.00 ± 7.03 cm and 157.00 ± 5.81 for normal adolescent girls. The mean weight of overweight and normal adolescent girls was 69.83 ± 6.82 kg and 51.83 ± 5.40 kg, respectively. It is also observed that mean waist circumference of girls with normal BMI was < 80 cm. The mean

body percentage was $34.77 \pm 3.22\%$ for overweight girls while it was $25.28 \pm 1.83\%$ for normal adolescent girls (Table 2).

It is clear that 46% of overweight subjects and 7% of normal subjects came under action Level II indicating high odds ratio for cardiovascular risk factors. 93% of normal subjects were found to have waist circumference < 80 cm (Table 3). A significant association was observed between BMI and waist circumference.

Table 4 summarizes that 89% of overweight subjects and 79% of normal weight subjects were non-vegetarians. With regard to meal consumption pattern of the subjects, 57% of overweight subjects consumed more than three meals a day while 61% of normal weight subjects had the habit of consuming three meals per day.

Table 1: Percentage distribution of subjects based on demographic profile

Particulars	Over weight	Normal weight
Age (years)		
18	12	17
19	8	28
20	23	3
21	26	29
22	31	23
Educational qualification		
Undergraduates	46	50
Postgraduates	54	50
Socioeconomic class		
Upper class	33	28
Upper middle class	61	67
Lower middle class	6	5

Table 2: Comparison of anthropometric measurements between normal and overweight subjects

Anthropometric indices	Mean±SD	t value	p value
Height (cm)			
Normal	157.00 ± 5.81	1.42	0.16 ^{NS}
Overweight	158.00 ± 7.03		
Weight (kg)			
Normal	51.83 ± 5.40	20.76	0.00**
Overweight	69.83 ± 6.82		
Waist circumference (cm)			
Normal	72.91 ± 4.42	0.97	0.00**
Overweight	80.55 ± 4.61		
Percentage body fat			
Normal	25.28 ± 1.83	0.00	0.00**
Overweight	34.77 ± 3.22		

** : Significant at $p < 0.01$, NS: Not significant, SD: Standard deviation

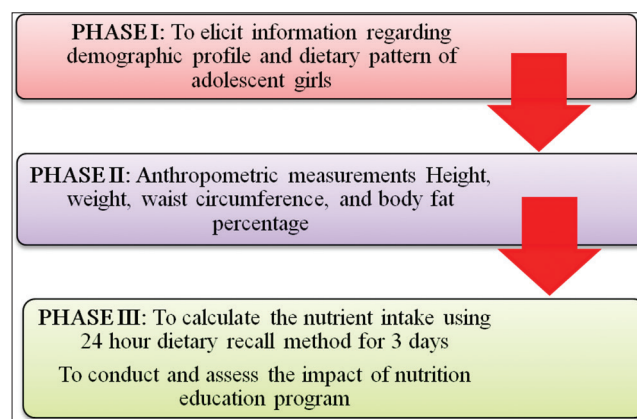


Fig. 1: Methodology adopted for the study

Table 3: Percentage distribution of subjects based on waist circumference

Waist circumference (cm)	Overweight	Normal weight	Chi-square value	p value
<80	54	93	39.04	0.00**
>80	46	7		

** : Significant at p<0.01

Table 4: Percentage distribution of subjects based on dietary practices

Particulars	Over weight	Normal weight
Type of diet		
Vegetarian	19	11
Non-vegetarian	79	89
Ovo vegetarian	2	0
Number of meals consumed		
1	4	1
2	4	2
3	61	40
More	31	57

With regard to skipping of meals, 73% of overweight subjects had the habit of skipping their meals and very often breakfast was found to be skipped by the subjects. Breakfast which is considered to be the most important meal of the day was frequently skipped by the subjects. Regular consumption of breakfast can positively impact children's health and well-being. On the other hand, parents should also encourage the children to consume breakfast regularly (Fig. 2).

Intake of junk foods is a recognizable aspect of teenage food behavior. With regard to consumption of junk foods, it was found that majority of the subjects in both the groups had the habit of eating junk foods (Fig. 3).

It is clear that 77% normal weight subjects had the habit of including fruits 3 or 4 times a week in their diet when compared to overweight subjects (Fig. 4). Inclusion of fruits on a regular basis is important as they a rich source of minerals, vitamins, phytochemicals, fiber, and antioxidants which lowers the risk of several long-term chronic illness.

The mean nutrient intake for both the groups is presented in Table 5. The intakes of all the nutrients were more than the RDA. Nutrient intake was found to be high among overweight subjects than the RDA (p<0.01).

Results of the test of significance reveal that there is a significant difference in nutrition knowledge and nutrition awareness among the subjects before and after the nutrition education program (p<0.01) Table 6. The results also clearly portraint that conducting such program creates awareness on health hazards of junk foods among adolescents thereby modifying their dietary pattern and preventing health problem related to junk food.

DISCUSSION

Adolescence is a period of rapid growth and development bridging childhood and adulthood. Practicing healthy eating behaviors is one of the most important factors to meet the nutritional needs of adolescents, and proper eating behaviors that are learned in early life are maintained in adulthood thereby reducing the risk for major chronic disease [7].

In the present study, the age group of the subjects was 18–22 years and 60% of the subjects in both the groups belonged to upper middle class. There is an inverse association between socioeconomic status and the nutritional status of children and adolescents as it has a significant effect on food intake [8]. With regard to anthropometric indices, the mean body weight, body fat percentage, and waist circumference were found to be high than that of normal adolescent girls (p<0.01).

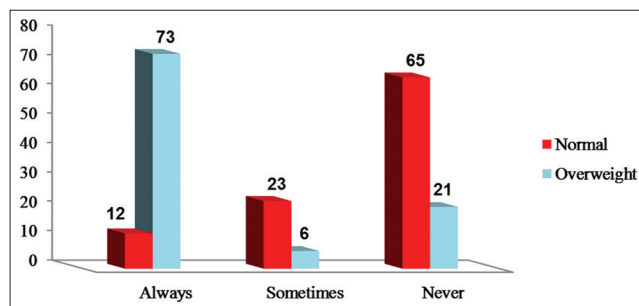


Fig. 2: Habit of skipping meals

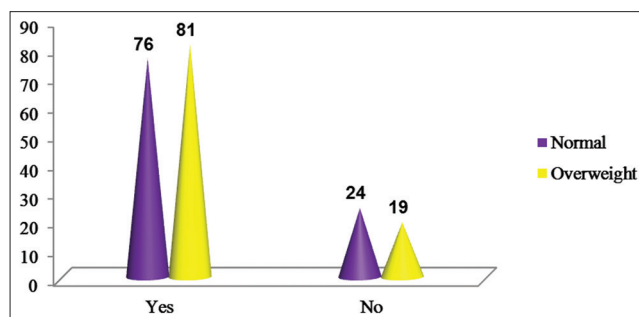


Fig. 3: Consumption of junk foods

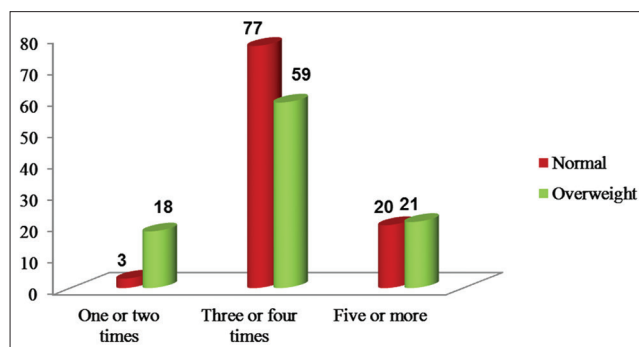


Fig. 4: Fruit consumption pattern

Majority of the subjects in both the groups were non-vegetarians while only a few percent of them were vegetarians. Regular meal consumption among adolescents is vital for providing adequate energy. With regard to meal skipping, 73% of overweight subjects had the habit of skipping meal, and breakfast was the most common skipped meal. Skipping breakfast leads to overeating at meals or drink sugar-sweetened beverage that increases the calorie intake, leading to weight gain. Story *et al.* [9] also reported that females had the habit of skipping meals more often than males.

Globalization and modern urbanization have greatly influenced one's eating habits and forced many people to consume fancy and high-calorie fast foods, popularly known as junk foods. The results of the study indicated that majority of the subjects in both the groups were fond of eating junk foods. Junk foods refer to those food items which are perceived to have little or no nutritional value and also have ingredients

Table 5: Nutrient intake of subjects in comparison to RDA

Nutrients	Categories	Actual intake Mean±SD	Recommended intake (per day)	t value	p value
Energy (Kcal)	Normal	1578.91±332.76	1900	-5.93	0.00**
	Overweight	2381.88±896.46			
Proteins (g)	Normal	71.98±112.73	55	0.52	0.60 ^{NS}
	Overweight	63.60±14.36			
Fat (g)	Normal	58.06±21.37	20	-4.06	0.00**
	Overweight	76.64±24.31			
Carbohydrates (g)	Normal	394.97±52.79	475	-7.40	0.00**
	Overweight	595.80±82.50			
Fiber (g)	Normal	17.13±5.06	25	-6.99	0.00**
	Overweight	27.66±389.36			
Calcium (mg)	Normal	549.58±275.03	600	-3.72	0.00**
	Overweight	733.72±216.61			
Iron (mg)	Normal	13.10±2.07	17	-6.62	0.00**
	Overweight	17.32±4.00			

** : Significant at p<0.01. SD: Standard deviation, RDA: Recommended dietary allowances

Table 6: Impact of nutrition knowledge and awareness

Nutrition education program	Mean±SD	t value	p value
Before nutrition education program	7.93±1.00	6.54	0.00**
After nutrition education program	8.77±0.75		
Before nutrition awareness	8.23±0.90	12.09	0.00**
After nutrition awareness	9.10±0.69		

** : Significant at p<0.01. SD: Standard deviation

considered unhealthy when eaten regularly. Dietary pattern in teen years has been associated with health risks for chronic diseases in adulthood. Inadequate consumption of fruits, vegetables, whole grains with high intake of fat, sodium, and simple carbohydrates results in higher prevalence of overweight among teenage adolescents. A study on the diet quality and nutritional status of rural adolescent girls in North India assessed that subjects followed a two-meal pattern with inadequate consumption of fruits and green leafy vegetables [10].

Inclusion of fruits in the diet is essential as they provide essential nutrients which the body needs also reduces the risk of obesity, stroke, hypertension, and cancer [11]. Consumption of soft drinks which is common among adolescent girls needs to be replaced with other alternative healthy options as soft drinks intake leads to several health issues. One healthy choice would be probiotic drink as it not only promotes the body's natural immunity and maintains the gut microflora [12].

Nutrition education program is a critical component of most major health promotions and diseases prevention programs among adolescents as it is considered to be a cost-effective way to improve health outcomes and foster healthy eating. Such programs bring about significant reduction in BMI, increase fruit and vegetable consumption and also show a positive impact on academic outcomes [13,14]. Research shows that 35-50 h per year of focused nutrition education is optimal to provide students with the required motivation and skills they need to make healthy choices [15].

CONCLUSION

Eating habits learnt during childhood tend to continue into adulthood. From the present study, it is evident that due to social, economic, and cultural influences, adolescent girls had the habit of following unhealthy dietary such as skipping meals, low intake of fruits, and consumption of junk foods that contributes to obesity. Hence, to make them aware about the ill effects of unhealthy diets, planning appropriate

nutritional educational strategies is essential. Implementation of such interventional programs for this group of students improves dietary quality, and to avoid unbalanced diets which prevent and delays the onset of chronic illness.

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