

## SHORT ARTICLE

## Nutrient intake of adolescents in rural area of Himachal Pradesh

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### Abstract

**Background:** The nutrient requirements during adolescence are higher than at any other stage of life. Inadequate nutrient intake leads to poor growth, delayed sexual maturation, slow linear growth, anaemia and osteomalacia.

**Aim & Objective:** To assess the nutrient intake of adolescents in 13-15 years belonging to rural area of Shimla district, Himachal Pradesh. **Material & Methods:** A school based cross-sectional study was conducted during 2014 - 2015 in rural area of Shimla district. Thirty clusters were identified using population proportionate to size sampling method. A total of 170 adolescents in the age group of 13-15 years studying in government schools were enrolled. Dietary assessment was done using 24h dietary recall method. **Results:** The percentage deficit in boys for calorie, iron, zinc and calcium intake was found 37.9%, 53.7%, 35.5% and 22.4% respectively as compared to Recommended Dietary Allowances (RDA). The girls had percentage deficit for calorie, iron, zinc and calcium intake as 47.7%, 61.5%, 53.6%, and 43.6 % respectively as compared to RDA. **Conclusion:** The findings of present study indicate that the nutrient intake of adolescents aged 13-15 years was inadequate.

### Keywords

Adolescent boys and girls; Dietary intake; Nutrient intake; Rural; India

### Introduction

Adolescence is an age of rapid growth and development. At this stage of life, the nutrient requirements are at a peak and are the higher than at any other stage of life. Failure to consume adequate diet at this time can result in poor growth, delayed sexual maturation, slow linear growth, anaemia and osteomalacia. Earlier studies have

documented high prevalence of undernutrition and nutrient deficiencies amongst adolescents (1,2). This may be due to socio-cultural factors, peer influences, body image; changes in the lifestyle and food habits of adolescents in recent past resulting in inadequate nutrient intake amongst adolescents (3). There is lack of data on the nutrient intake amongst school age children in the rural area of Himachal Pradesh.

## Aims & Objectives

To assess the nutrient intake of adolescents in 13-15 years belonging to rural area of Shimla district, Himachal Pradesh.

## Material & Methods

A school based cross-sectional study was conducted during 2014-2015 in rural area of Shimla district, Himachal Pradesh. The nutrient intake was assessed using 24 hour dietary recall oral questionnaire method using standardized utensils.

Since the school enrollment was more than 90%, the children studying in the school were considered as a proxy for children residing in the area. Thirty clusters were identified using population proportionate to size sampling method. The result of this large survey has been published earlier (4). Subsequently, the adolescents in the age group of 13-15 years were enlisted. A minimum of 5 children were selected from each cluster (school) with the help of random number table. The children were briefed regarding the objectives of the study; informed consent was taken from parents of all subjects. A total of 170 children in the age group of 13-15 years studying in Government schools were enrolled in the study as depicted in the flow diagram. The study was approved by the ethical committee of the All India Institute of Medical Sciences, New Delhi.

The dietary intake of essential micronutrients amongst subjects was assessed using one-day 24hour dietary recall method. The following steps were undertaken: i) Information regarding the meal pattern and the food items (cooked and uncooked) consumed by the subjects was recorded ii) The quantity of each food item consumed by the individual subject was assessed using standard cups/spoons/chapatti models. The models were used to help recall the quantities consumed by each respondent. iii) For each food item consumed, the raw ingredients used for the preparation was recorded iv) The amount of raw weight in grams of each food item consumed by the individual subject was calculated v) Nutritive value of the raw foods consumed was determined using the Food Composition table (5). Daily nutrient intake in terms of energy, protein, fat, iron, zinc, calcium, thiamine, riboflavin, niacin, and ascorbic acid were compared against Recommended Dietary Allowances (RDA) suggested by the Indian Council of Medical Research (5).

**Sample size calculation:** The sample size was determined considering 39% prevalence of malnourishment amongst children of Himachal Pradesh as per National Family Health Survey (NFHS-3), with 10% precision and design effect of 1.5; the minimum sample size calculated was 142 children.

A pretested semi structured questionnaire was administered to each child to obtain information. Assessment of socioeconomic status (SES) was done using Kuppuswamy's SES scale (6).

## Results

A total of 170 children (75 boys; 95 girls) in the age group of 13 to 15 years were included. The mean age ( $\pm$ SD) for both boys and girls was  $14.1 \pm 0.9$  years. According to SES, 114 (73.1%) and 37(23.7%) subjects belonged to middle and lower SES, respectively. Mean daily nutrient intake of adolescent subjects has been depicted in [Table 1](#). According to 24 hour dietary recall data, diet of both boys and girls were deficient in all nutrients. The percentage of energy deficiency was 37.9% for boys and 47.7% for girls. The overall intake of iron amongst boys and girls was  $14.8 \pm 7.6$  mg and  $10.4 \pm 7.3$  mg, respectively. Both girls (61.5%) and boys (53.7%) did not meet the RDA for iron. Likewise, percentage deficit for zinc as compared to RDA was noted 35.5% in boys and 53.6 % in girls. Further, percentage deficit for calcium was 22.4% for boys and 43.6 % for girls as compared to RDA.

## Discussion

The nutrient intake of children in the age group of 13-15 years living in rural area of district Shimla, Himachal Pradesh was inadequate for all the nutrients as compared to RDA. We found inadequate intake for nutrients such as energy, protein, iron and zinc. Earlier studies have also shown similar results of inadequate intake of these nutrients in the diets of the school age children (7,8,9)

Increased iron requirements for growth amongst adolescents and menstruation in girls puts a great demand for iron supply in the diet 10. High prevalence of anaemia amongst girls has been documented in different states of India including Himachal Pradesh (10, 11). The inadequate intake of iron found in the present study is a cause of great concern. Zinc deficiency can lead to poor growth and sexual maturation in adolescents. Earlier study amongst adolescents has estimated the dietary zinc intake as to be 60% of the RDA (12). Low calcium intake during adolescence may lead to decreased

bone mass accrual thereby increasing the risk of osteoporotic fractures (13,14). We found that boys and girls were consuming 77.6% and 56.4% of calcium compared to RDA.

The present study revealed overall dietary intake of nutrients such as energy and protein was higher amongst boys compared to girls. Similar findings have reported in National Nutrition Monitoring Bureau (NNMB) survey (15).

### Conclusion

Present study revealed 37.9% and 47.7% deficit intake of calorie among boys and girls, respectively. The adolescents also had inadequate dietary intake of vitamins, iron, zinc and calcium.

### Recommendation

The study highlights the need of nutrition awareness and consumption of balanced diet amongst adolescent children.

### Limitation of the study

Present study is the part of an earlier published study and dietary information may be influenced by recall bias.

### Relevance of the study

To the best of our knowledge, it is the first study providing information on nutrient intake amongst adolescents residing in Shimla district, Himachal Pradesh.

### Authors Contribution

RK: Manuscript writing - Critical revision of the article, GS: Data collection, Manuscript writing, Critical revision of the article, AG: Critical revision of the article, Manuscript writing, UK: Designed the work - Drafted the article, Manuscript writing, Critical revised the article, Approved the final version of the manuscript for publication, RMP: Statistical interpretation, ADU: Statistical interpretation.

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**Tables**

**TABLE 1 NUTRIENT INTAKE OF CHILDREN AGED 13-15 YEARS (N= 170)**

Nutrients	Boys (n=75)			Girls (n=95)		
	ICMR, RDA	Mean ±SD	% Deficit	ICMR, RDA	Mean ±SD	% Deficit
Energy (kcal)	2750	1707.5 ±596.1	37.9	2330	1218.3 ±442.7	47.7
Protein (g)	54.3	53.0 ±19.0	2.4	51.9	37.6 ±14.3	27.6
Fat (g)	45	41.8 ±18.4	7.1	40	32.2 ±18.3	19.5
Iron (mg)	32	14.8 ±7.6	53.7	27	10.4 ±7.3	61.5
Zinc (mg)	11	7.1 ±3.0	35.5	11	5.1 ±1.2	53.6
Calcium(mg)	800	620.4 ±362.7	22.4	800	451.5 ±288.4	43.6
Thiamine(mg)	1.4	1.3 ±0.6	7.1	1.2	0.9 ±0.4	25.0
Riboflavin (Mg)	1.6	1.0 ±0.6	37.5	1.4	0.7 ±0.5	50.0
Niacin (mg)	16	11.6 ±5.0	27.5	14	7.9 ±3.2	43.6
Vitamin C (mg)	40	34.9 ±38.8	12.7	40	35.0 ±39.0	12.5

**Figures**

**FIGURE 1 Flow diagram of the study**

