

## **Nutrient intake of rural school going children (7-9 years) of Bhiwani district of Haryana state**

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### **ABSTRACT**

Nutrient intake of 100 school going children (7-9 years) in two village *viz.* Alakhpura and Barsi in Bawani Khera blocks of Bhiwani district was studied. Dietary assessment was done by 24 hour dietary recall method for three consecutive days of 100 children. Mean daily intakes of nutrients such as energy, fat,  $\beta$ - carotene, B-complex vitamins, vitamin C, iron and calcium were found significantly lower than their respective RDAs in the diets of school children. It was also observed that the nutrient intake was higher in boys as compared to girls and intake of energy and protein was marginally inadequate (50-74.9% of RDA). The most limiting nutrients in diet of majority of respondents were iron,  $\beta$ - carotene, thiamine, folic acid and vitamin B<sub>12</sub> in school children of both the villages.

**Key Words :** Nutritional status, School children, Nutrient intake, Recommended dietary allowances

### **INTRODUCTION**

School going children are the future generation of any country and their nutritional needs are critical for the well being of society. Good nutrition during school-age is critical to cover the deficits suffered during childhood. Food is a major concern of the mankind beginning from the time of conception and extending through the entire life span of the individual. Food supplies the energy for physical activity and other metabolic needs of the body. Children need energy for deposition of tissues. Energy is also required for physical activity of daily life. Carbohydrates, fats and proteins in the food are the chief energy yielding nutrients. Protein is the second most abundant substance in the body, next to water. Protein helps the child to grow, as the constituent amino-acids are necessary for the synthesis of tissue in the body (Ghai *et al.*, 2005). Dietary intake with respect to adequate availability of food in terms of quantity and quality, ability to digest, absorb and utilize food and the social discrimination against girls can greatly affect the adequate nutrition of these children.

According to Chandra and Sehgal (1994), growth and nutritional status of preschool

and school-going children are profoundly influenced by the diet consumed by them. Dietary intake serves as the best indicator for assessing nutritional status. For their optimal growth and development, the school-age children require adequate nutritious food to meet their daily nutritional requirements (Evans *et al.*, 2000). During these age-groups, deficiencies of protein/ calorie in diet result in underweight, wasting, stunted growth, low immunity and also impaired cognitive and motor development and learning. According to NNMB, technical report (National Nutrition Monitoring Bureau, 2002), the proportion of household with energy inadequacy was about 70%, while that protein adequacy was about 27%. According to Kulsum *et al.* (2008), diets of children were inadequate in terms of types of food items. Only 22% of children consumed diets adequate in protein and energy, protein calorie adequacy was influenced by the age and gender of children and by literacy and economic status of mothers. Keeping this in view the present investigation was planned and conducted to determine the nutritional status of selected school children (7-9 years) of two villages of Bhiwani district in Haryana.

### METHODOLOGY

To accomplish the objectives of the study a total of 100 school children of 7-9 years were selected randomly from two villages of Bhiwani district in Haryana. A well structured interview schedule was prepared in accordance with the methodological procedure keeping in view the objectives of the investigation. The interview schedule was pretested initially, based on the responses obtained and difficulties realised, suitable amendments were made to make it more functional.

The data was collected with the help of interview schedule by paying repeated visits to the study area and the responses were obtained on independent and dependent variables to meet the requirements of the study.

#### Nutrient intake :

Nutrients namely energy, protein, fat, calcium, iron, β-carotene, thiamine, riboflavin, niacin, vitamin B<sub>12</sub>, Vitamin C, folic acid and zinc intake were calculated using food composition table (Gopalan *et al.*, 2004). Average daily nutrient intake of the respondents was compared with Recommended Dietary Allowance (RDA) (ICMR, 2010).

$$\text{NAR\%} = \frac{\text{Intake}}{\text{RDA}} \times 100$$

#### Adequacy of food and nutrient intake :

The adequacy of food and nutrient intakes of the respondents were categorized into the following four groups:

Category	Range	Score
Adequate	100% and above	I
Marginally adequate	75-99.9%	II
Marginally inadequate	50-74.9%	III
Inadequate	Below 50%	IV

**Statistical analysis :**

The qualitative data were quantified according to the standard methods. The qualitative and quantitative data were tabulated to draw meaningful inferences. The data was analysed with the help of percentage, mean and standard deviation, analysis of variance by using complete randomised design, z- test and t- test.

**RESULTS AND DISCUSSION****Mean daily nutrient intake of school going children :**

The results on mean daily nutrient intake of school children (boys and girls) 7-9 years of age are presented in Table 1 and 2.

**Energy :**

Mean daily intake of energy among the school children was found to be 1231.40 Kcal (72.86% of RDA) which was significantly ( $P \leq 0.01$ ) lower than RDA (Table 1). But on comparison basis, mean daily intake of energy by boys 1242.10 Kcal (79.41% of RDA) and by girls 1220.70 Kcal (78.15% of RDA), it was found that the intake of energy of boys was higher than girls, however the difference was non- significant (Table 2). The results are in line of those reported by Neelam *et al.* (2007), Mitra *et al.* (2007) and Bisht and Raghuvanshi (2008) who reported that energy intake of school children were low when compared with RDA. Similarly, children of Hisar district received inadequate energy (82.9% of RDA) as investigated by Rana *et al.* (2013).

**Protein :**

Results regarding mean daily intake of protein revealed that mean intake of protein by the school going children was 21.58 g which was significantly ( $P=0.01$ ) lower than RDA

Table 1 : Mean daily nutrient intake of school going children				(n=100)
Nutrients	RDA	Mean daily nutrient intake	Z value	Overall intake (% of RDA)
Energy (Kcal)	1690	1231.40±121.16	29.59**	72.86
Protein (g)	29.5	21.58±2.80	28.28**	73.15
Fat (g)	30	17.72±1.90	64.63**	59.07
Calcium (mg)	600	315.80±79.28	35.84**	52.63
Iron (mg)	16	9.44±1.62	40.49**	59.00
β- carotene (ug)	4800	1350.96±112.16	307.51**	28.14
Thiamine (mg)	0.8	0.46±0.13	26.15**	57.50
Riboflavin (mg)	1.0	0.45±0.16	34.37**	45.00
Niacin (mg)	13.0	5.48±1.62	46.42**	42.15
Vitamin C (mg)	40	29.89±2.63	38.44*	74.72
Folic Acid (ug)	120	78.16±14.88	28.12**	65.13
Vitamin B <sub>12</sub> (ug)	0.2-1.0	0.14±0.05	12.00**	70.00

Values are mean ± SD

RDA-Recommended Dietary Allowances (ICMR 2010)

Z-value shows comparison of nutrients intake with RDA

(73.15% of RDA) (Table 1). Significant (P=0.05) differences were observed between protein intake of boys and girls (Table 2). Per cent intake of protein was 75.66 and 70.61% of RDA among boys and girls respondents, respectively. Several workers (Mitra *et al.*, 2007, Sati and Dahiya, 2012 and Mehta *et al.*, 2013) also reported that the protein intake was relatively lower among school children.

**Fat :**

Mean daily intake of fat was found to be 17.72 g which was 59.07 % of RDA *i.e.* significantly (P=0.01) lower than RDA (Table 1). On comparing the mean daily intake of boys and girls *i.e.* 18.10 and 17.34 g/day, respectively, which was significantly (P=0.05)

Foodstuffs (g)	Recommended dietary allowances (RDA)	Mean daily nutrient intake				'Z' <sup>b</sup> value
		Boys (n=50)	'Z' <sup>a</sup> value	Girls (n=50)	'Z' <sup>a</sup> value	
Energy (Kcal)	1690	1242.10±121.65 (79.41)	20.22**	1220.70±120.94 (78.15)	21.58**	0.88 <sup>NS</sup>
Protein (g)	29.5	22.32±2.29 (75.66)	22.17**	20.83±3.08 (70.61)	19.90**	2.76**
Fat (g)	30	18.10±1.90 (60.33)	44.28**	17.34±1.86 (57.80)	48.12**	2.05*
Calcium (mg)	600	325.50±91.57 (54.25)	21.19**	306.10±64.21 (51.02)	32.36**	1.23 <sup>NS</sup>
Iron (mg)	16	10.12±1.70 (60.37)	26.37**	8.76±1.51 (57.62)	31.74**	2.61**
-Carotene (µg)	4800	1383.66±106.60 (28.83)	226.58**	1318.26±108.96 (27.46)	225.92**	3.03**
Thiamine (mg)	0.8	0.48±0.12 (60.00)	18.85**	0.43±0.14 (53.75)	18.68**	1.92 <sup>NS</sup>
Riboflavin (mg)	1.0	0.47±0.18 (47.00)	20.81**	0.44±0.15 (44.00)	26.39*	0.91 <sup>NS</sup>
Niacin (mg)	13	5.70±1.69 (43.85)	30.53**	5.26±1.53 (40.46)	35.76**	1.42 <sup>NS</sup>
Vitamin C (mg)	40	30.12±1.50 (75.30)	46.57**	29.66±3.40 (74.15)	21.50**	0.87 <sup>NS</sup>
Folic acid (µg)	120	81.04±11.48 (67.53)	23.99**	75.28±16.28 (62.73)	18.29**	2.04*
Vitamin B <sub>12</sub> (mg)	0.2-1.0	0.15±0.05 (15.00)	7.67**	0.13±0.04 (13.00)	12.37**	2.22*

Values are mean ±SD

Values in parentheses indicate percentage

'Z'<sup>a</sup> values showing comparison of mean nutrient intake and RDI

'Z'<sup>b</sup> value showing comparison between boys and girls

lower than RDA. Mean daily intake of boys was found higher than girls (Table 2).

#### **Calcium :**

Mean daily calcium consumption of school going children was 315.80 mg/day which was significantly ( $P=0.01$ ) lower than the RDA and it was 59.07% of RDA (Table 1). On comparing the mean daily intake of boys and girls with the RDA, it was found that the boys were taking higher amount of calcium (325.50 mg/day) than the girls (306.10 mg/day) respondents (Table 2). There was a non-significant difference between the calcium intake of boys and girls. Sankhala *et al.* (2004) found that intake of calcium was 58.7% of RDA by children (7-9 years) of Udaipur city.

#### **Iron :**

The data on nutrient intake indicated that intake of iron by school going children (7-9 years) was 9.44 mg (59.00% of RDA) and significantly ( $P\leq 0.01$ ) lower than RDA (Table 1). On comparison basis also both boys and girls mean daily intake of iron was 10.12 and 8.76 mg, respectively, which was only 60.37 and 57.62% of RDA. A significant difference was also noted in boys and girls that boys were taking higher amount of iron intake as compared to girls (Table 2). Findings of earlier studies (Kumari and Jain, 2005, Srihari *et al.*, 2007 and Neelam *et al.*, 2007) reported same trend that diet of school going children was deficient in iron. Jood *et al.* (2002) noted that iron intake of 7-9 years old children was below 50% of RDA.

#### **S-carotene :**

The mean daily intake of  $\beta$ -carotene by school going children (7-9 years) was 1350.96  $\mu\text{g}$  *i.e.* only 28.14% of RDA which was significantly ( $P=0.01$ ) lower than RDA (Table 1). It was found that boys had higher (1383.66  $\mu\text{g}$ ) intake of  $\beta$ -carotene than girls (1318.26  $\mu\text{g}$ ) (Table 2).

#### **Thiamine :**

In school going children (7-9 years), the mean daily intake of thiamine was found to be 0.46 mg which was significantly ( $P=0.01$ ) lower than RDA (Table 1). On comparing the mean daily intake of boys and girls with the RDA, it was found that the boys were taking higher amount of thiamine (0.48 mg/day) than the girls (0.43 mg/day) respondents (Table 2).

#### **Riboflavin :**

The daily mean intake of riboflavin of school going children (7-9 years) was 0.45 mg which was significantly ( $P=0.01$ ) lower than the RDA (Table 1). The overall intake of riboflavin was 45% of RDA. Comparatively girls were consuming less riboflavin (44% of RDA) than the boys (47% of RDA) (Table 2).

#### **Niacin :**

The data on mean daily nutrient intake depicted that the daily intake of niacin by school going children (7-9 years) was 5.48 mg which was significantly ( $P=0.01$ ) less than RDA and

was only 42.15% of the recommended dietary allowance (Table 1). In comparison to boys and girls with the RDA, it was found that the boys were taking higher amount of niacin (0.5.70 mg/day) than the girls (5.26 mg/day) respondents (Table 2).

**Vitamin C :**

The mean daily intake of vitamin C was found to be 29.89 mg which was 74.72% of the RDA (Table 1). On comparison, it was observed that boys were taking higher amount (30.12 mg) as compared to the girls (29.66 mg) (Table 2).

**Folic acid :**

Perusal of data presented in Table 1 revealed that the mean daily folic acid intake by school going children (7-9 years) was 78.16 µg which was significantly ( $P \leq 0.01$ ) less in comparison to RDA. The mean daily intake of folic acid by boys was 81.04 µg and girls was 75.28 µg (Table 2) and differ significantly ( $P=0.05$ ).

**Vitamin B<sub>12</sub> :**

The mean daily intake of vitamin B<sub>12</sub> by school going children (7-9 years) was 0.14 µg which was only 70.00% of RDA and significantly ( $P=0.01$ ) lower than RDA (Table 1). The intake of vitamin- B<sub>12</sub> in boys was slightly higher (0.15 µg) than the girls (0.13 µg). Intake of vitamin B<sub>12</sub> among boys and girls differ significantly ( $P=0.05$ ) (Table 2).

According to Sankhala *et al.* (2004) diet of school children of Udaipur district was deficient in β- carotene (294µg or 12.3% of RDA), vitamin C (21.1 mg or 52.9% of RDA), riboflavin (0.5 mg or 41% of RDA) and niacin (7.9 mg or 60.8% of RDA). Lower content of folic acid, riboflavin and Vitamin C in diet of affluent Indian school children was observed by Srihari *et al.* (2007) too. Sati and Dahiya (2012) reported that the diet of school children of Hisar was lacking in β- carotene, B- complex vitamins and Vitamin C. According to Bisht and Raghuvanshi (2008) intake of iron, β- carotene and riboflavin was most inadequate among school going children of Kumaon hills of Uttarakhand State.

**Adequacy of nutrient intake by school going children :**

The result of present in Table 3 revealed that intake of energy and protein was marginally

Table 3: Adequacy of nutrient intake of school going children (n=100)												
Category of adequacy	Energy	Protein	Fat	Calcium	Iron	-Carotene	Thiamine	Riboflavin	Niacin	Vitamin C	Folic Acid	Vitamin B <sub>12</sub>
I	5	6	9	28	3	5	19	15	9	17	20	6
II	31	30	47	50	8	21	23	34	41	13	27	8
III	47	57	34	16	23	29	28	25	33	34	25	12
IV	17	7	10	6	66	45	30	26	17	36	28	74

- I 100% and above (Adequate)
- II 75 to 99.9% of RDA (Marginally adequate)
- III 50 to 74.9% of RDA (Marginally inadequate)
- IV Below 50% of RDA (Inadequate)

inadequate (50-74.9% of RDA). The most limiting nutrients in diet of majority of respondents were iron,  $\beta$ - carotene, thiamine, folic acid and vitamin B<sub>12</sub>. Almost similar results were observed by Mehta *et al.* (2013). They reported that intake of energy, iron, vitamin A and vitamin C was inadequate in diet of 7-12 years old children. Sankhala *et al.* (2004) reported inadequacy for iron, calcium,  $\beta$ - carotene, riboflavin, niacin and vitamin C in diet of majority of school going children.

### Conclusion :

It may be concluded from the present study that nutrients like energy, fat,  $\alpha$ - carotene, B-complex vitamins, vitamin C, iron and calcium were found limiting and significantly lower than their respective RDAs in the diets of school children. The most limiting nutrients in diet of majority of respondents were iron,  $\alpha$ - carotene, thiamine, folic acid and vitamin B<sub>12</sub>. Hence, there is an urgent need to promote the importance of balanced diet and preparation of nutrient-rich recipes based on locally available food stuffs to improve their nutrient intake.

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