

Nutritional Assessment of Rural School-Going Children (7-9 Years) of Hisar District, Haryana

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Abstract

The present study was conducted in Hisar district, Haryana to assess the nutritional status of 200 rural school going children (7-9 years). Nutritional status of children was assessed in terms of dietary assessment, anthropometric measurement and clinical assessment of signs and symptoms of various nutrient deficiency diseases. Dietary assessment was done by 24 hour dietary recall method for three consecutive days of 100 children. Anthropometric measurements were used to construct indices for malnutrition that were compared to reference values. The results of the study revealed that food and nutrient intake was inadequate and anthropometric measurements (mean height and weight) were significantly ($P < 0.05$) lower than reference value. Regarding prevalence of malnutrition, it was found that 54.11 percent of the children were stunted and 55.5% were underweight. 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 nutritional status. Awareness programs regarding affordable but nutritious foods should be introduced by the government through community participation, involvement of NGOs and other sectors. Results of the study can be of use for planning need-based supplementary nutrition programs by the policy-makers for the school children.

Keywords: Nutrition; Vitamins; Malnutrition

Introduction

Historically, the science of nutrition developed in part from the study of disease entities brought about by inadequate diet. Nutritional status is the condition of health of an individual as influenced by nutrient intake and utilization in the body. Malnutrition is major public health problem in developing countries. Freedom from hunger and malnutrition is a basic human right and their alleviation is fundamental prerequisite for human and national development. Usually referred to as silent emergency, it has devastating effects on children, society and future humankind. The term malnutrition refers to both under-nutrition as well as over-nutrition. Better nutrition means stronger immune system, less illness, better health and productive community. In developing countries like India various forms of malnutrition affect a large segment of population and both macro and micronutrient deficiencies are of major concerns. The school age period is nutritionally significant because this is the prime time to build up body stores of nutrients in preparation for rapid growth of adolescence. Nutrition plays a vital role, as inadequate nutrition during childhood may lead to malnutrition, growth retardation, reduced work capacity and poor mental and social development [1]. In children, protein/calorie deficient diet results in underweight, wasting and lowered resistance to infection, stunted growth and impaired cognitive development and learning. The situation of child malnutrition is also grave in Haryana state as according to National Family Health Survey (2005-2006), the prevalence of wasted, stunted and underweight children in this state was found to be 19, 38 and 46 percent, respectively. Most of the research work that has been conducted on nutritional status of children is limited to infants and preschool children only. There is dearth information on nutritional status of school going children particularly from rural areas. Keeping this in view, the objective of present study was to assess the nutritional status of rural school-going children of Hisar district, Haryana.

Materials and Methods

The present study was conducted on school going children in the

age group 7-9 years. Total 200 rural school going children i.e. 100 boys and 100 girls were selected proportionately for the study, from the Govt. Primary School of Mangali and Kaimri villages of Hisar district, Haryana.

Information regarding the socio-economic profile was collected with the help of questionnaire-cum-interview schedule. Food and nutrient intake of children 100 school-going children was recorded using 24 hours recall method for three consecutive days. Cooked food consumed, was converted into their raw equivalents. Mean food and nutrient intake was calculated by taking mean of three days intake and compared with recommended dietary allowances [2].

Nutritional status of all the selected children was assessed by measuring body height (cm), weight (kg) which was compared with the NCHS(National Center for Health Statistics) Standards and the standards given by ICMR (Indian Council of Medical Research) (2008). Height of children was measured by a vertical measuring rod calibrated in centimetres placed on plain floor. Weighing balance calibrated in kilogram and gram was used for taking weight of respondents.

Malnutrition was calculated as normal, mild, moderate and severe according to *Gomez classification* [3] of weight for age, *Waterlow classification* [4] for height for age.

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Food Stuffs (gm)	RDI (gm)	Mean daily food intake	z value	Overall intake %age of RDI
Cereals	270	119.14 ±24.77	-61.07**	44.12
Pulses	70	42.69±20.58	-13.27**	60.98
Fats & Oils	25	8.35 ±2.77	-60.10**	33.40
Sugars & Jaggery	30	6.83±2.78	-83.34**	22.76
Green Leafy Vegetables	100	35.14±36.44	-17.81**	35.14
Roots & tubers	100	49.83±33.12	-15.14**	49.83
Other Vegetables	100	39.01±23.54	-25.90**	39.01
Fruits	100	28.70±18.15	-39.28**	28.70
Milk & Milk products	500	123.92±52.16	-72.10**	24.78

Values are mean ± SD

Z value shows comparison of nutrients intake with RDI.

RDI- Recommended Dietary Intake (ICMR 2008).

**Significant at 1% level.

*Significant at 5% level.

Table 1: Mean daily food intake of school children.

Nutrients	RDA	Mean daily nutrient intake	z value	Overall intake (% of RDA)
Energy (KCal)	1690	957.12±219.53	-33.38**	56.66
Protein (gm)	41	38.52±10.07	-2.46**	93.95
Fat (gm)	25	13.12±3.68	-32.28**	52.48
β- carotene (ug)	4800	1678.4±1486.96	-20.99**	34.9
Vit. B ₁ (mg)	0.8	0.49±0.15	-20.66**	61.25
Vit. B ₂ (mg)	1.0	0.36±0.15	-42.66**	36.0
Vit. B ₃ (mg)	13.0	3.75±1.57	-61.66**	28.84
Vit. B ₁₂ (ug)	1.0	0.07±0.05	-186**	7.0
Folic Acid (ug)	120	83.88±63.21	-5.71*	69.9
Vit. C (mg)	40	26.43±22.33	-6.08*	66.07
Iron (mg)	25	7.15±5.47	-33.05**	28.6
Calcium (mg)	400	289.12±134.26	-8.26**	72.28

Values are mean ± SD

** Significant at 1% level RDA- Recommended Dietary Allowances (ICMR 2008).

* Significant at 5% level z-value shows comparison of nutrients intake with RDA.

Table 2: Mean daily nutrient intake of school children (7-9 years).

Anthropometric Parameter	Boys (n = 100)				Girls (n = 100)			
	Reference value	Observed value	z-value	% Reference value	Reference value	Observed value	z-value	% Reference value
Height (cm)	126.98	111.26 ± 12.04	-13.05**	87.62	126.40	105.94 ± 12.19	-16.78**	83.81
Weight (kg)	25.34	18.3 ± 5.23	-13.30**	72.21	25.00	20.24 ± 3.32	-14.33**	80.96
Triceps skin fold (mm)	15.19	4.92 ± 1.45	-70.82**	32.38	17.88	4.26 ± 1.08	-126.11**	23.83

Values are Mean ± SD

**Significant at 1% level

Z-value indicates comparison of observed and reference values.

*Significant at 5% level

Reference values are according to ICMR (2008)

Table 3: Mean Anthropometric measurements of school children (7-9 years).

Age	7- <8 years		8-<9 years		9- <10 years	
	Boys (n=48)	Girls (n=37)	Boys (n=25)	Girls (n=26)	Boys (n=27)	Girls (n=37)
Mean Height (cm)	105.14±10.09 (86.3)	100.77±9.46 (83.55)	113.08±10.87 (89.03)	102.28±7.79 (89.03)	120.42±9.19 (91)	113.68±14.02 (86.1)
NCHS Standard	121.70	120.60	127.00	126.40	132.20	132.20
t-value	-14.78**	-12.79**	-6.40**	-15.76**	-6.65**	-8.05**
Mean weight (kg)	19.76±2.44 (103.56)	19.06±2.29 (104.46)	20.34±3.01 (96.48)	19.68±3.55 (98.0)	22.70±3.89 (95.33)	21.77±3.64 (94.35)
NCHS Standard	19.08	18.21	21.08	20.08	23.81	23.03
t- value	1.94 ^{NS}	2.29*	1.23 ^{NS}	-0.57 ^{NS}	1.5 ^{NS}	-2.13*

Values are Mean ± SD

*Significant at 5% level ^{NS} Non-significant

**Significant at 1% level 0 Figures in parentheses indicate percentage

NCHS- National Centre for Health Statistics (2008)

Table 4: Mean Anthropometric measurements of school children (7-9 years) by age and gender.

Results and Discussion

Food consumption pattern revealed that the daily mean intake of the food groups i.e. cereals, pulses, fats and oils, sugar and jaggery, milk and milk products, green leafy vegetables, other vegetables, roots and tubers and fruits, was found to be significantly ($P<0.01$) lower than the recommended dietary intake, however the intake of pulses was adequate (60.98%). Similar were the findings of [5-10] who reported that the diets were cereals based and very low frequency of consumption of protective foods including green leafy vegetables in the diet of school children.

Regarding the intake of the nutrients viz. energy, fat, β-carotene, B-complex vitamins, vitamin C, iron and calcium except protein was found to be significantly ($P<0.01$) lower than the recommended dietary allowances, the lowest being iron (28.6%) and Vitamin B₁₂ (7%). It was also observed that the nutrient intake was higher in boys as compared to girls. The present findings corroborate with those of [11-13]. The mean intakes per day as well as how much this varies from RDA are given in table 1.

The mean height and weight of younger children (7 -< 8 years) was significantly lower than the NCHS standard value. The mean height and weight of older boys and girls (8 to >9 years) was lower up to 13 and 18 percent than NCHS standard. A significant difference was found in mean height and weight of three age groups among boys and girls. This result is supported by a study Easwaran and Poorani [14] conducted on school children in age range of 6-12 years (Tables 2-5).

Prevalence of malnutrition

Regarding prevalence of malnutrition, it was found that 54.11 percent of the school children were stunted and 55.5% were underweight. According to BMI for age classification it was observed that only 11 percent of the children had BMI less than 5th percentile of the WHO standards, which indicates that children were undernourished [15]. It was also observed that malnourishment was more prevalent among

Age (years)	Normal (>95 % of NCHS Standard)	Stunting		
		Mild (90-95 % of NCHS Standard)	Moderate (85-90 % of NCHS Standard)	Severe (<85% of NCHS Standard)
7- <8 years (n=85)	12 (14.11)	6 (7.0)	21 (24.70)	46 (54.11)
8-<9 years (n=51)	8 (15.6)	5 (9.8)	7 (13.7)	31 (60.7)
9-<10 years (n=64)	15 (23.4)	19 (29.6)	6 (9.3)	24 (37.5)
Gender				
Boys (n=100)	23 (23.0)	18 (18.0)	17 (17.0)	42 (42.0)
Girls (n=100)	12(12.0)	12 (12.0)	17 (17.0)	59 (59.0)

Water low (1972)
Figure in parentheses indicate percentage
NCHS Standards (2008)

Table 5: Nutritional Status of school children according to Waterlow classification by age and gender.

Age (years)	Normal (90-110% of NCHS Standard)	Malnutrition		
		Grade I (75-90 % of NCHS Standard)	Grade II- Moderate (60-74.9 % of NCHS Standard)	Grade III- Severe (<60% of NCHS Standard)
7- <8 years (n=85)	65 (76.4)	17 (20.0)	3 (3.5)	-
8-<9 years (n=51)	37 (72.5)	12 (23.5)	2 (3.9)	-
9-<10 years (n=64)	40 (62.5)	21 (32.8)	3 (4.6)	-
Gender				
Boys (n=100)	75 (75.0)	18 (18.0)	7 (7.0)	-
Girls (n=100)	67 (67.0)	32 (32.0)	1 (1.0)	-

Gomez (1955)
Figure in parentheses indicate percentage
NCHS Standards (2008)

Table 6: Nutritional Status of school children according to Gomez classification by age and gender.

girls but boys were also affected. Finding of earlier study [16] showed that stunting was higher in boys of Delhi as compared to girls. In girls, prevalence of wasting was higher in comparison to boys as also reported by Chowdhary.

Summary

Food consumption pattern revealed that the daily mean intake of the food groups i.e. cereals, pulses, fats and oils, sugar and jaggery, milk and milk products, green leafy vegetables, other vegetables, roots and tubers and fruits, was found to be significantly ($P<0.01$) lower than the recommended dietary intake, however the intake of pulses was adequate (60.98%). Regarding the intake of the nutrients viz. energy, protein, fat, β -carotene, B-complex vitamins, vitamin C, iron and calcium was found to be significantly ($P<0.01$) lower than the recommended dietary allowances, the lowest being iron (28.6%) and Vitamin B₁₂ (7%). It was also observed that the nutrient intake was higher in boys as compared to girls (Table 6).

Anthropometric measurements showed that mean height, weight and skin fold thickness at triceps were significantly ($P<0.05$) lower than the reference value in both boys and girls and significant difference was found on comparing the anthropometric measurement of boys and girls. Regarding prevalence of malnutrition, it was found that 54.11 percent of the school children were stunted and 55.5% were underweight. According to BMI for age classification it was observed that only 11 percent of the children had BMI less than 5th percentile of the [17] WHO standards, which indicates that children were undernourished. It was also observed that malnourishment was more prevalent among girls but boys were also affected.

Conclusion

Hence it may be concluded that the consumption of foods was inadequate and nutrients were found to be limiting nutrients in the diets of school children. So there is an urgent need to educate mothers

of school going children about the importance of balanced diet and promote the consumption of foods like cereals, pulses, green leafy vegetables, roots and tubers, sugar and jaggery, fats and oil, milk and milk products, fruits etc. in the children's diet to improve their nutritional status so that children contribute in the well-being of the nation as children are the future of the nation's prosperity. Awareness programs regarding affordable but nutritious foods should be introduced by the government through community participation, involvement of NGOs and other sectors. The findings of the study will be useful for the policy makers for improving the functioning of mid-day meal program running in the different districts of Haryana and this will go a long way in overcoming nutrient deficiencies among school children.

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