

## DIETARY INTAKE AND NUTRITIONAL STATUS OF SCHOOL CHILDREN OF KUMAON HILLS

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### ABSTRACT

Inadequate nutrition in childhood may lead to malnutrition, growth retardation, reduced work capacity and poor mental and social development. The requirement of energy, protein and calcium in children of Kumaon hills were met upto 50 to 75 per cent of RDA and that of niacin was met upto 70-85 per cent. Intake of iron, carotene and riboflavin was most inadequate. This inadequate intake of nutrient was reflected in their anthropometric measurements which revealed that average height and weight of the population under study was less than the Indian well-to-do male and female children of the same age group as given by ICMR (1989). Based on Waterlow classification, only 45.0 per cent subjects were normal and remaining had varying degrees of malnutrition.

**Key words :** Nutritional status, Children, Anthropometric measurements, Per cent RDA, Dietary intake

Children are our future citizens. They form an important segment of any community. They contribute to the vital human potential and in future would impart strength to the national economy and development. Better the nutritional status of the children, higher will be their mental agility, functional capabilities and will lead to the nation's rise. Despite exemplary medical advances and technological progress, good health and well-being continue to elude a large majority of the world's population. Nutrition, being a critical determinant of human health, good health becomes all the more elusive in the presence of malnutrition (Bhaskaram, 2001). Despite various programs being run in the country, the nutritional status of 33 per cent females and 28 per cent males is below normal. The condition of children is worse as about 46 per cent children of 0-6 years age are underweight in India and the percentage of children categorized as underweight in Uttarakhand is 38 (NFHS, 2006). Malnutrition is not a simple matter of whether a child can satisfy his or her appetite. A child who eats enough to satisfy immediate hunger can still be malnourished. Three quarters of the children who die worldwide of malnutrition related causes are mildly to moderately malnourished and betray no outward signs of problems. Of the nearby 12 million children under five who die each year in developing countries mainly from preventable causes, the deaths of

over 6 million are either directly or indirectly attributable to malnutrition (UNICEF, 1998).

### METHODOLOGY

A total of 160 subjects, aged 10-15 years, were randomly selected from three middle schools and two inter colleges of Bhimtal block in Nainital district of Uttarakhand state. Subjects were interviewed for obtaining general information, dietary intake and anthropometric data using pre-tested survey schedules. The general information regarding the subjects included type of family, family size, number of children in the family, total family income, education and occupation of the parents and per capita income. For anthropometric data, measurements were taken in triplicate and average value was recorded. Means of body weights and heights were computed for male and female subjects separately. The extent of malnutrition in children was assessed by Waterlow classification based on height for age and weight for height. For dietary survey, subjects were given out the developed proforma for filling in diets consumed by them for two days. Household measures such as *katories*, glasses and models of *chapaties* of different diameter were shown to assist them to fill in the amounts correctly. Nutritive value of diets consumed per day by the children was calculated in terms of energy, protein, calcium, iron,  $\alpha$ -carotene, thiamine, riboflavin, niacin and vitamin 'C' using the food composition tables of Gopalan *et al.* (1989). Average daily intake was thereafter computed and compared with the ICMR (1989) recommendations. Data on consumption

pattern of food by the subject was also collected using food frequency questionnaire. The collected data was tabulated and simple statistical techniques as frequency, percentage, mean scores and standard deviation were calculated. (Imran and Conover, 1983).

## RESULTS AND DISCUSSION

### *General information :*

Nuclear families were found to be more common than joint and extended families. More than 80 per cent of the families were nuclear whereas only 10.6 per cent were joint families and 7.5 per cent were extended type. Similar were the findings of Rita (1988) and Goel (1996) in some parts of district U.S.Nagar; Awasthi (1996), Jain (1998) and Mahar (1998) in Nainital district and Upadhyay (1999) and Gupta (2000) in Bhimtal block. The average size of family was 6.6 and majority had five to eight members in the family (75 %). Majority (61.8 %) of parents had 4 to 6 children with the average being 3.9 and the range between 1 and 11. About 12.5 per cent of the subjects were vegetarian and 87.5 per cent were non-vegetarian. Literacy level of the parents of the subjects was 96.2 per cent for fathers and 69.4 per cent for mothers. Though literacy for male and female both was very high, however it was only 54.3 per cent male who had completed education till high school or above, whereas only 13.7 per cent females had education till high school or above. According to 2001 census data, male literacy in Uttaranchal (now known as Uttarakhand) was 84 per cent and female literacy was 60.3 per cent, so the literacy condition of these villages was found better as compared to that of whole Uttarakhand. The data regarding occupation of parents revealed that 55.6 per cent of the fathers were in service and only 10 per cent were engaged in farming activity. Majority (90 %) of the mothers were housewives and similar were the findings of Gupta (2000). On the basis of per capita income, subjects were classified according to modified Prasad classification for income level for rural population as per June, 2001 which revealed that majority (45.6 %) of the subjects were having their per capita income between Rs 236.85 to Rs 457.91. On an average, per capita income was found to be Rs 452.42 with the range of Rs 129.60 to Rs 2000.00.

### *Anthropometric measurements :*

In comparison with the Indian well-to-do male and female children of the same age group as given by ICMR (1989), the average height and weight of the population under study was less than well-to-do Indian children (Fig 1 and 2). When the children were distributed according

Table 1: General profile of hill school children (N=160)

Particulars	Per cent of subjects
Age (years)	
10-12	50.0
13-15	50.0
Sex	
Male	40.0
Female	60.0
Family type	
Nuclear	81.9
Joint	10.6
Extended	7.5
Family size	
1-4	10.6
5-8	75.0
>8	14.4
Number of children per set of parents	
1-3	33.8
4-6	61.8
>6	4.4
Birth order of the subject child	
1-2	58.8
3-4	33.1
5-6	7.5
>6	0.6
Food habit	
Vegetarian	12.5
Non-vegetarian	87.5
Educational status of father	
Illiterate	3.8
Primary	18.1
Secondary	23.8
High school	29.4
Intermediate	20.6
Graduation	4.3
Educational status of mother	
Illiterate	30.6
Primary	28.2
Secondary	27.5
High school	10.6
Intermediate	2.5
Graduation	0.6
Occupation of father	
Service	55.6
Business	19.4

*Contd.....*

Contd....Table 1

Labour	15.0
Farmer	10.0
Occupation of mother	
Service	7.5
Housewife	90.0
Business	1.3
Farmer	1.2
Per capita income	
Class I (Rs 1579.00 and above)	0.6
Class II (Rs 789.50 to 1563.21)	6.3
Class III (Rs 473.70 to 773.71)	35.6
Class IV (Rs 236.85 to 457.91)	45.6
Class V (Rs less than 236.85)	11.9

to their height and weight then it was found that majority of the subjects' height and weight were below 5<sup>th</sup> percentile of NCHS reference value. Only 6.5 per cent and 5.6 per cent children had height and weight

respectively, more than 50<sup>th</sup> percentile of NCHS value which indicate that the children of this region have comparable potential to grow. It is only the poor nutrition and micro-environment including the disease pattern that works against them to achieve their full potential.

**Dietary information :**

Two types of eating pattern were found to be followed by subjects. Some of the subjects consumed two meals a day, one in the morning consisting of *dal* and rice and one at night consisting of *chapatti* and *subji* (Table3). This finding is similar to those of Awasthi (1996) and Jain (1998). Rest of the subjects ate meal thrice a day. Before going to school in the morning the breakfast included tea, *chapatti* and *subji*. Few of the subjects brought lunch boxes in which they brought *chapatti* with pickles or *subji* whereas few used to buy biscuits, namkeen and toffees from the nearby shops. After returning from school, the children used to have lunch consisting of rice and dal and then they had dinner mainly of *subji* and *chapatti* at night.

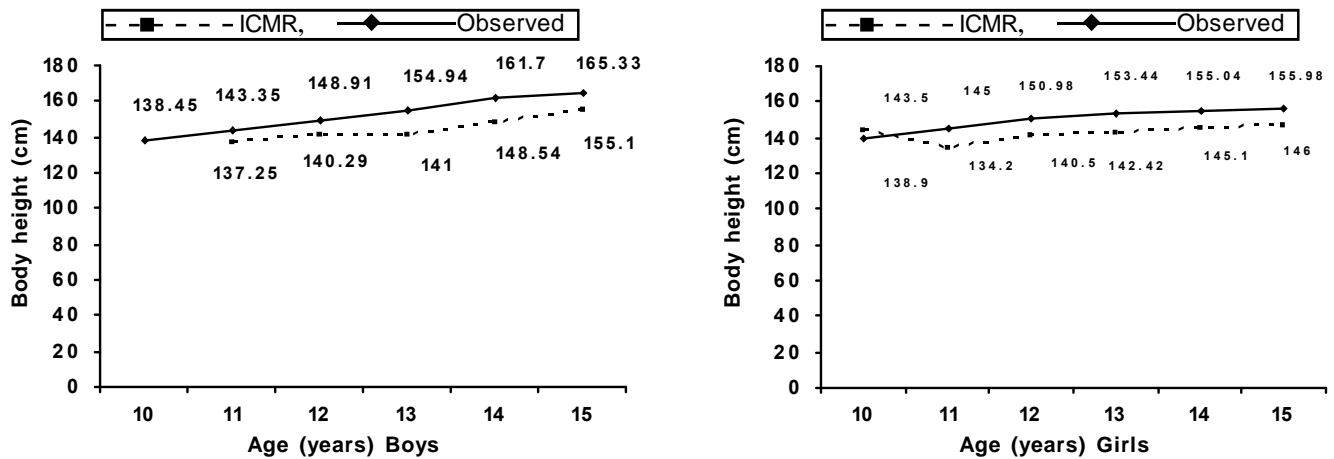


Fig.1: Comparison of observed height of hill school children with height of well-to-do Indian children (ICMR, 1989)

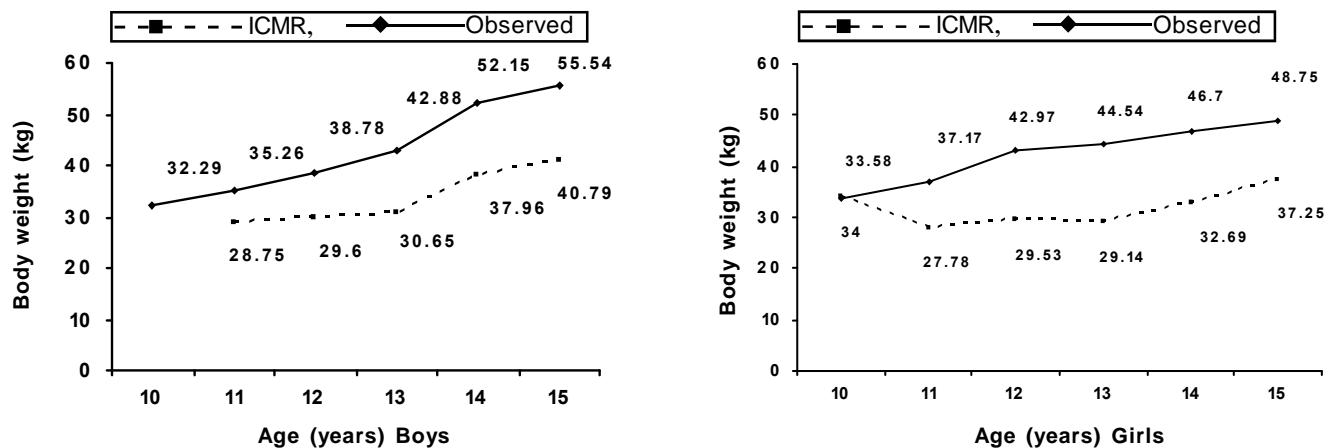


Fig. 2 : Comparison of observed weight of hill school children with weight of well-to-do Indian children (ICMR, 1989)

Table 2 : Distribution of hill school children according to their height and weight (N=160)

Percentile NCHS	Per cent of subjects	
	Height	Weight
< 5	50.6	64.4
5-10	13.8	8.1
10-25	16.9	14.4
25-30	11.9	7.5
50 <sup>th</sup>	-	-
50-75	2.5	2.5
75-90	3.1	2.5
90-95	1.2	0.6
>95	-	-

Similar eating pattern was found out by Gupta (2000).

The results regarding consumption frequency of foods by the subjects (Table 3) revealed that cereals, pulses, fats and oils and sugar and jaggery were being consumed daily while consumption of other food groups varied from daily to never. Green leafy vegetables were being consumed daily by only 8.8 per cent of the subjects. Most of the subjects (42.5 %) were consuming these only thrice a week. As this is the major source of  $\beta$ -carotene for the low income group thus the carotene intake of the population under study was found inadequate. Parts of the population under study were having their own milch animals. Therefore, the milk was being consumed daily by 46.2 per cent of the subjects. Though 87.5 per cent of the subjects were non-vegetarian by habit but 66.9 per cent were consuming meat, fish and eggs occasionally due to economic constraints. A survey was done by NIN, Hyderabad in 2004-05 in 9 states of the country to evaluate the dietary pattern of the population. The results of the survey also revealed that the intake of all the food groups, except for roots and tubers, was below the

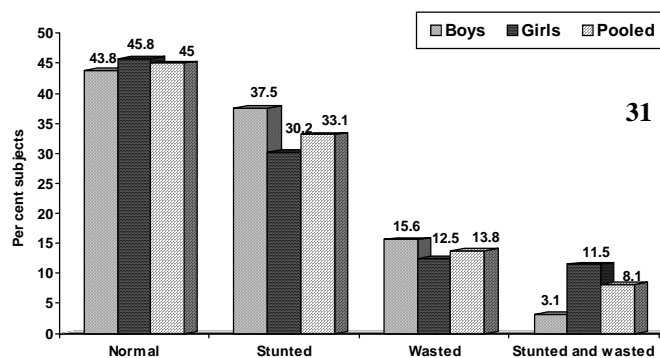


Fig. 3 : Sexwise distribution of hill school children according to Waterlow classification

recommended level in all the age/sex/activity level groups. The intake of pulses, green leafy vegetables, milk and fruits was highly inadequate because of which intake of micro-nutrients like iron, vitamin A, riboflavin and folic acid was below the RDA in all the age groups (NIPCCD, 2007).

The energy, protein and calcium intake of boys and girls was found to be between 50 to 75 per cent of the RDA but iron, carotene and riboflavin intake was most inadequate both for boys and girls (Table 4). For boys, aged 13-15 years, average iron and riboflavin intake was 12.0 mg and 0.65 mg which is 29.3 per cent and 43.3 per cent of the RDA, respectively. Similarly average carotene intake for girls, aged 13-15 years, was 1013.0  $\mu$ g which is 42.2 per cent of the RDA. Only thiamin and vitamin C intake for both sex was found to be above 100 per cent of the RDA. Average intake of all the nutrients by the subjects except for thiamine and vitamin C was found to be below the recommended dietary allowance given by ICMR (1989). The survey done by NIN in Indian states in 2004-05 revealed that the per cent adequacy of calories and protein in boys of age 10-12 years was 84.4 % and

Table 3: Consumption frequency of foods among hill school children (% of subjects)

Foods	Daily	Thrice a week	Twice a week	Once a week	Occasionally	Never
Cereals	100.0	-	-	-	-	-
Pulses	100.0	-	-	-	-	-
Green leafy vegetables	8.8	42.5	25.0	17.5	4.4	1.8
Roots and tubers	89.4	5.6	2.5	0.6	1.9	-
Other vegetables	94.4	3.1	0.6	1.9	-	-
Fruits	35.0	10.6	15.0	20.0	19.4	-
Milk and milk products	46.2	2.6	6.2	12.5	31.9	0.6
Oils and fats	100.0	-	-	-	-	-
Meat, fish and eggs	-	1.9	3.7	11.9	66.9	15.6
Sugar and jaggery	100.0	-	-	-	-	-

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Table 4: Average nutrient intake of subjects per day

Nutrients	Boys		Girls	
	10-12 years Mean ± SD	13-15 years Mean ± SD	10-12 years Mean ± SD	13-15 years Mean ± SD
Energy (kcal)	1368 ± 197.5	1405 ± 192.2	1268 ± 244.1	1373 ± 150.2
RDA	2190	2450	1970	2060
Protein (g)	40.0 ± 6.8	42.0 ± 8.1	37.0 ± 5.1	41.0 ± 5.3
RDA	54	70	57	65
Calcium (g)	413.0 ± 182.8	405.0 ± 158.3	371.0 ± 159.6	406.0 ± 176.8
RDA	600	600	600	600
Iron (mg)	11.7 ± 1.7	12.0 ± 1.85	10.8 ± 1.9	12.02 ± 1.66
RDA	34	41	19	28
- carotene (µg)	896.0 ± 751.25	1176.0 ± 970.9	1064.0 ± 1297.4	1013.0 ± 1209.8
RDA	2400	2400	2400	2400
Thiamine (mg)	1.13 ± 0.16	1.2 ± 0.17	1.08 ± 0.16	1.47 ± 1.84
RDA	1.1	1.2	1.0	1.0
Riboflavin (mg)	0.64 ± 0.13	0.65 ± 0.13	0.57 ± 0.15	0.65 ± 0.17
RDA	1.3	1.3	1.2	1.2
Niacin (mg)	10.9 ± 1.42	11.6 ± 0.13	10.34 ± 1.7	11.5 ± 1.64
RDA	15	16	13	14
Vitamin C (mg)	88.0 ± 65.4	94.0 ± 57.5	89.0 ± 70.4	83.0 ± 61.1
RDA	40	40	40	40

105.2 %, respectively whereas in girls of that age group, it was 75.2 % and 80.2 %, respectively. The respective per cent adequacy of calories and protein in boys of age 13-15 years was 89.2 % and 95.9 % whereas in girls of that age group it was 101.8 % and 100.9 %. So it was found that school going children were taking adequate amount of protein and energy in their diet. The intake of

iron in different states was found very less as per cent adequacy of iron in boys and girl of age group 10-12 years was 55 % and 79.5 % whereas in age group of 13-15 years, it was 53.9 % for boys and 76.4 % of girls. The vitamin A intake was also less as the per cent adequacy in boys and girls of age 10-12 years was 51.1 % and 51.6 % respectively, and in age 13-15 years, it was 59.4 % for

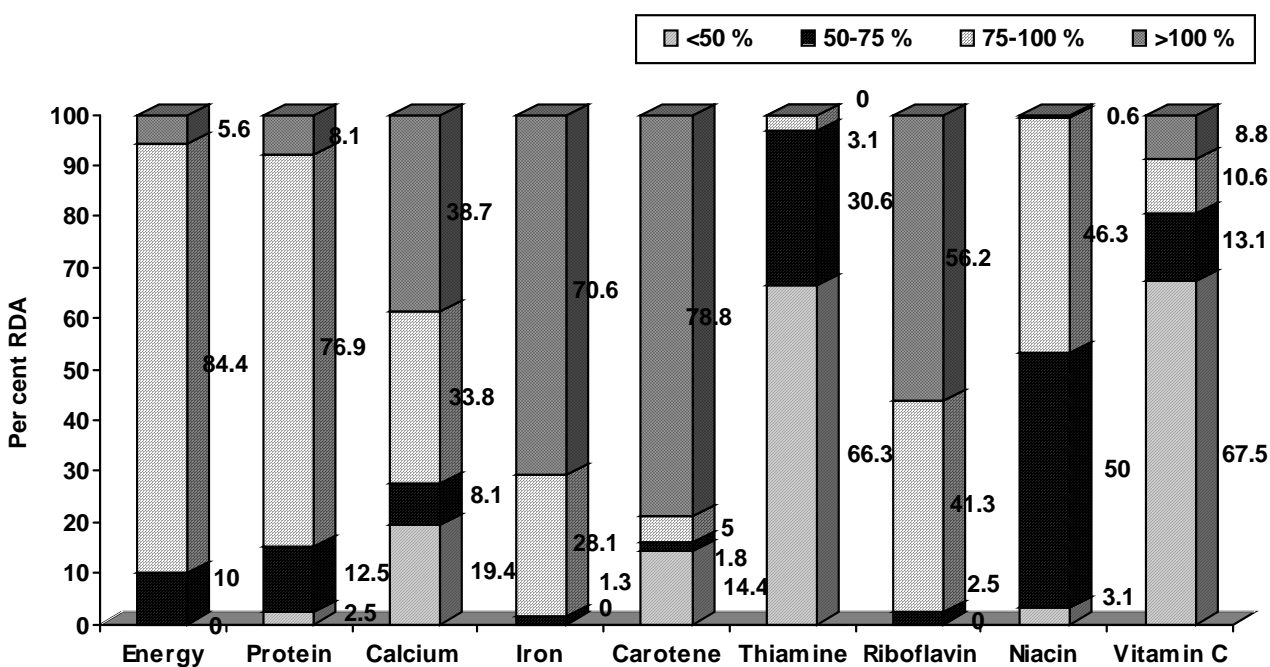


Fig 4: Per cent RDA of nutrient consumption of hill school children

boys and 61.6 % for girls (India, 1998).

Per cent RDA of nutrient consumption of the subjects was calculated by comparing daily nutrient intake of subjects with their RDAs given by ICMR (1989) and the subjects were classified in the categories more than 100 per cent of RDA, 75-100 per cent of RDA, 50-75 per cent of RDA and less than 50 per cent of RDA. The results revealed that 84.4 per cent and 76.9 per cent of the subjects were consuming energy and protein 50-75 per cent of RDA respectively, whereas intake of calcium, iron, carotene and riboflavin by majority of the subjects was less than 50 per cent of RDA. Only thiamin and vitamin C intake was found to be more than 100 per cent of RDA by most of the subjects. It was due to inclusion of more cabbage in their meals. The per cent nutrient adequacy was found to be comparable between male and female subjects.

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**REFERENCES**

**Awasthi, N.** and Kumar, A. R. (1999). Nutritional status of hill primary school children. *Indian Journal of Nutrition and Dietetics*, **36**(10):453-459.  
**Bhaskaram, P.** (2001). The cycle of malnutrition and women's health. *Nutrition News, NIN*, Hyderabad. **22** (4).  
**Goel, M.** and kumar, A.R. (1998). Effect of media combination on child nutrition related knowledge and attitude of rural mothers. *Journal of Home Science*. **17** (2): 135-140.  
**Gopalan, C.,** Ramasastri, B.V. and Balasubramaniam, S.C. (1989). Nutritive Value of Indian Foods. NIN. Indian Council of Medical Research, Hyderabad. 156 p

**Gupta, S.** (2000). Nutrition education on vitamin A among hill middle school children through video. *M. Sc. Thesis* (unpublished) GBPUA&T, Pantnagar. India.  
**ICMR** (1989). Nutritive Value of Indian Foods, Hyderabad, NIN: 37-39.  
**Imran, R.L.** and Conover, W.J. (1983). A modern approach to statistics. New York, John Wiley and sons. *Inc.* 497p.  
**India.** (1998) Human Resource Development Ministry. Women and Child Development Department. *India Dietary Profile*, 1998. New Delhi. pp 14-18.  
**Jain, S.** (1998). Nutrition education for primary school children: effectiveness of media combination. *M.Sc. Thesis* (unpublished) GBPUA&T, Pantnagar. India.  
**Mahar, P.** (1998). Nutritional profile of hill primary school children. *M. Sc. Thesis* (unpublished) GBPUA&T, Pantnagar. India.  
**NFHS.** (2006). In: Statistics on women in India. New Delhi. National Institute of Public Co-operation Child Development. (2007). pp139-140.  
**NIPCCD.** (2007). Statistics on women in India. New Delhi. National Institute of Public Co-operation Child Development. pp 145-146.  
**Rita.** (1988). Nutritional status of under five years old children of migrant agricultural labour families. *M.Sc. Thesis* (unpublished). GBPUA&T, Pantnagar. India.  
**UNICEF.** (1998). The state of the world's children 1998: A UNICEF Report. Malnutrition: causes, consequences and solutions. *Nutrition Reviews*, **56** (4):115-123.  
**Upadhayay, S.** (1999). Impact of nutrition education on primary school children by involving local school teachers. *M. Sc. Thesis* (unpublished) GBPUA&T, Pantnagar. India.

