

Nutrition and health status of urban and rural women of Garhwal region

NEETU DOBHAL AND RITA SINGH RAGHUVANSHI

The study comprised of 180 non-pregnant, non-lactating women from town Barkot and villages namely Sada, Kotiyalgaon, Uprari and Bhatia of district Uttarkashi of Uttarakhand. Uttarkashi is one of the districts of Uttarakhand, the western Himalayan hill state of India. The information was collected on socio-economic status, nutritional status, anthropometric measurements, nutritional knowledge and use of traditional foods. Urban women had higher literacy level (87.8%) than rural women (62.3%). The average BMI was found to be 21.89 ± 2.4 kg/m² for urban subjects and 20.73 ± 2.1 kg/m² for rural subjects. Body density ranged from 1.01 to 1.05 in urban subjects and 1.02 to 1.06 in rural subjects. About 87.8 per cent urban and 82.2 per cent rural subjects were found to be anaemic with the mean haemoglobin concentration of 9.71 ± 1.6 g/100ml and 10.48 ± 1.7 g/100ml, respectively. The per cent RDA intake of protein, fat, calcium, thiamine, riboflavin, niacin and ascorbic acid was more than 100 per cent. The intake of energy and iron was 86.8 and 80.5 per cent of RDA for all the subjects. The traditional foods used by the families were found to be nutritious. The most significant health problems of women of Uttarkashi were anaemia, followed by chronic energy deficiency, which can be taken care of by the use of traditional foods including green leafy vegetables and pulses.

Key Words : Nutritional profile, Correlates of malnutrition, Uttarkashi, Anthropometric measurements, Traditional foods, Nutritional security

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INTRODUCTION

District Uttarkashi, one of the 13 districts of Uttarakhand, situated at the height of 1250 meters and the most sparsely populated district of Uttarakhand is characterized by the rugged terrain, harsh climate, water scarcity, lack of basic amenities and mass migration of able-bodied males to plains. The large scale out-migration of men in search of employment in the plains or in the army has led to more drudgery on female members of the families of Uttarakhand. Women play a very important role in the economy and daily life of Uttarakhand hills. They participate in almost all the economic ventures like agriculture, animal husbandry, horticulture and collection of

fuel, food and fodder from forest. They also actively participate in the agricultural activities like clearing the fields, sowing, watering, weeding, harvesting and in storing the grains (Raghuvanshi, 2002) and thus, is one of the most vulnerable sections of the population from health and nutrition point of view. In view of the above mentioned aspects, the present research was undertaken to study nutritional status of the women residing in the urban and rural areas of district Uttarkashi and to compare the nutritional status of the women residing in urban area to the women living in rural areas.

METHODOLOGY

The study was carried out during winters in district Uttarkashi in the year 2003. The sample comprised of 180 women of 18-60 years age, randomly selected from urban (90) and rural (90) areas. These 90 women were then further divided into 3 groups each comprising 30 subjects *i.e.* 18-30 years, 31-45 years and 46-60 years. The urban population was selected from the town Barkot while rural population was selected from villages of Sada, Kotiyal gaon, Uprari and Bhatia of district Uttarkashi.

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While selecting the sample, care was taken to not include pregnant, lactating and chronically ill women in the study.

Information on socio-economic status was collected through a structured questionnaire by personal interview. For the assessment of nutritional knowledge of the women, a questionnaire consisting of objective type questions was formulated. For each correct answer, one mark was allotted and for wrong answer, zero mark was given. On the basis of wide variations in the scores obtained by the subjects, nutritional knowledge was divided into 3 categories *viz.*, Low (scores from 0 to 5), medium (scores from 6 to 10) and high (scores from 11 to 15).

Dietary intake of subjects was assessed using two methods *i.e.* 24-hour dietary recall and food frequency questionnaire. Average of different nutrient intake values was calculated by using the table values (Gopalan, 1989) and was compared with the recommended dietary allowances for Indians (ICMR, 1989). Anthropometric measurements like height, weight, mid-upper-arm-circumference (MUAC) and skin folds at triceps, biceps, subscapula and suprailliac were measured using standard methods (Jelliffe, 1966) and body density, per cent body fat and fat-free mass of subjects were computed (Durnin and Womersley, 1974). Body mass index (BMI) of the subjects was computed and subjects were classified into various categories of CED (James *et al.*, 1988). All the subjects were examined for clinical deficiency signs. Haemoglobin concentration (g/100ml) was estimated by using Sahli's method (Lamberg and Rothstein, 1978).

OBSERVATIONS AND ASSESSMENT

The result of the present study have been discussed in detail as under:

Socio-economic profile:

The results of the present study revealed that majority (69.44%) of the women were living in nuclear families with 82.2 per cent in urban area and 56.6 per cent in rural areas (Table 1). The per cent prevalence of extended families was more in rural areas (32.2%). Family size ranged from 2 to 13 family members with an average of 4.97 ± 3.6 for nuclear, 8.55 ± 3.1 for joint and 6.84 ± 2.5 for extended urban families and 4.69 ± 2.4 for nuclear, 8.77 ± 3.2 for joint and 6.88 ± 4.7 for extended rural families. Out of total population, 25 per cent were illiterate. Literacy rate in the study population was found to be 75 per cent, which is higher than the value reported in a study (Rawat, 2003) as 60.3 per cent. The data of the present study showed that 88.8 per cent of the urban women were sedentary workers whereas majority of the rural women (56.6%) were heavy workers. Among the rural group, women of 31-45 years were having maximum work load followed by the women of 46-60 years.

Tap water was the main source of water for 95.5 per cent urban subjects whereas 37.7 per cent of the rural women

brought water from the nearby streams. About 80 per cent rural women were using wood as a main fuel whereas L.P.G was the main fuel for 82.2 per cent urban subjects. Majority of the urban women were in service (34%) whereas a major portion of rural subjects *i.e.* 80 per cent of the women of 31-45 and 46-60 years of age groups was engaged in dual occupation showing the greater physical work load on the rural women.

It was seen that 76 per cent study population had family income more than Rs. 4000 per month with an average family income of Rs. 10534 ± 5347 for urban subjects and Rs. 5787 ± 4026 for rural subjects. The average per capita income per month of urban subjects ranged between Rs. 600 to Rs. 6000 with an average of Rs. 2176 whereas in case of rural subjects, the range of per capita income per month varied between Rs. 256 to Rs. 4000 with an average of Rs. 959. A statistically significant difference was found between the per capita income of rural and urban subjects ($p=0.05$).

Nutritional knowledge:

Majority (58.8%) of urban women fell under the category of "high knowledge" whereas among the rural women, majority (46.6%) was categorized as having "low knowledge" (Table 2). In both urban and rural areas, nutritional knowledge was found decreasing with the advancement of ages and in all the age groups, urban women were having better nutritional knowledge than the rural women. Nutritional knowledge was found to be significantly and positively correlated with the educational level ($r=0.844$, $p=0.01$).

Anthropometric measurements and body composition:

The mean anthropometric measurements of urban and rural women of Uttarkashi are presented in Table 3. The mean height, weight, and MUAC of rural women of district Uttarkashi was higher than the values reported by Bishnoi *et al.* (1999), Emundson and Emundson (1989), NNMB (1981), Deshpande *et al.* (2001) and Gautam and Thakur (2009).

In the present study, weight was found to be positively correlated with age ($r=0.476$). The skin fold thickness at all sites along with MUAC was found higher in urban subjects. This may be due to heavy manual work of rural women. MUAC and triceps skin fold (TSF) measurements were classified into different percentiles given by NHANES-I (1971-74). The results revealed that for MUAC, 14.43 per cent urban and 13.26 per cent rural women and for TSF, 17.73 per cent urban and 29.96 per cent rural subjects were at the risk of malnutrition as they had MUAC and TSF less than 5th percentile. Body density of the study population ranged from 1.01 to 1.06 with an average of 1.033 for urban subjects and 1.035 for rural subjects. Body fat for the subjects ranged from 6.42 to 23.1kg with mean of 14.31 ± 2.8 kg and 13.75 ± 2.2 kg for urban and rural women, respectively.

The average per cent body fat of women of Uttarkashi

Table 1. Socio-economic profile of urban and rural women of Uttarkashi (%)

Characteristics	16-30 years		31-45 years		46-60 years		Urban	Rural
	Urban	Rural	Urban	Rural	Urban	Rural		
Family type								
Nuclear	83.3	60	80	63.3	83.3	53.3	82.2	56.6
Joint	10	6.6	3.3	10	6.6	10	6.6	8.8
Extended	6.6	33.3	16.6	26.6	10	36.6	11.1	32.2
Family size								
Up to 4	33.3	10	36.6	33.3	30	26.6	33.3	23.3
5-6	43.3	40	40	40	33.3	36.6	38.8	38.8
7-8	13.3	30	13.3	6.6	23.3	16.6	16.6	17.7
>8	10	20	10	20	13.3	20	11.1	20
Social category								
General	73.3	80	80	80	73.3	76.6	75.5	78.8
Backward	13.3	6.6	10	10	13.3	13.3	12.2	10
SC/ST	13.3	13.3	10	10	13.3	10.1	12.2	11.1
Education								
Illiterate	3.3	6.6	10	33.3	23.3	73.3	12.2	37.7
Primary	0	0	3.3	20	30	16.6	11.1	12.2
High school	33.3	23.3	13.3	16.6	10	3.3	18.8	14.4
Intermediate	26.6	50	6.6	16.6	10	6.6	14.4	24.4
Graduate	26.6	16.6	40	13.3	16.6	0	27.7	10
Post graduate	10	3.3	26.6	0	3.3	0	15.5	1.1
Occupation								
Own farming	0	3.3	3.3	0	0	0	1.1	1.1
Service	13.3	0	56.6	6.6	33.3	6.6	34.4	4.4
Housewife	0	10	36.6	13.3	60	13.3	32.2	12.2
Agricultural labourer	3.3	0	3.3	0	6.6	0	4.4	0
Student	0	10	0	80	0	80	0	56.6
Dual occupation	83.3	76.6	0	0	0	0	27.7	25.5
Type of house								
Kuchcha	3.3	0	6.6	6.6	0	10	3.3	5.5
Pucca	90	46.4	93.3	26.6	93.3	16.6	92.2	30
Wooden house	6.6	53.3	0	66.6	6.6	73.3	4.4	64.4
Fuel used								
Wood	16.6	56.6	10	90	10	96.6	12.2	81.1
LPG	83.3	43.3	80	10	83.3	3.3	82.2	18.8
Kerosene oil	0	0	10	0	6.6	0	5.5	0
Activity pattern								
Sedentary	90	40	90	10	86.6	13.3	88.8	21.1
Moderate	6.6	50	3.3	6.6	13.3	10	7.7	22.2
Heavy	3.3	10	6.6	83.3	0	76.6	3.3	56.6

Table 2. Nutritional knowledge of the women (%)

Level of nutrition knowledge	16-30 years		31-45 years		46-60 years		Urban	Rural
	Urban	Rural	Urban	Rural	Urban	Rural		
Low (0-5)	3.3	10	13.3	53.3	26.6	73.3	14.4	46.6
Medium (6-10)	16.6	13.3	23.3	26.6	40	20	37.7	20
High (11-15)	80	76.6	63.3	20	33.3	6.6	58.8	34.4

Table 3. Anthropometric measurements and body composition of the subjects

Variables	16-30 years		31-45 years		46-60 years		Urban	Rural
	Urban	Rural	Urban	Rural	Urban	Rural		
Height (cm)	150.83± 8.03	153.46± 6.4	152.40± 6.6	153.33± 6.1	152.93± 6.5	153.96± 6.0	152.05 ± 7.04	153.8 ± 6.16
Weight (kg)	45.30± 6.6	48.10± 5.2	56.86± 3.9	50.43 ± 5.6	52.86± 5.9	51.03± 4.7	51.67 ± 5.46	49.85± 5.16
MUAC (cm)	22.33± 2.9	22.76± 2.9	25.96± 3.3	24.26 ± 2.9	25.46 ± 2.9	24.25± 2.0	24.8± 3.03	23.75± 2.0
Biceps SFT (mm)	6.76± 1.4	6.36± 1.4	8.36± 1.5	7.16± 1.5	7.66± 1.9	6.66± 1.4	7.57 ± 1.6	6.72± 1.4
Triceps SFT (mm)	8.10± 1.2	7.86± 1.5	9.70± 1.7	9.70± 1.8	9.20± 1.5	8.70± 1.7	10.0± 1.4	8.75± 1.6
Suprailiac SFT (mm)	15.40± 2.0	12.27± 3.0	15.70± 4.3	13.96± 2.1	15.83± 4.3	13.23± 1.8	11.96 ± 3.1	10.39± 1.5
Supscapular SFT (mm)	10.00± 1.8	10.23± 1.7	12.40± 3.9	10.50± 1.4	13.50± 3.5	10.46± 1.5	15.64± 3.5	13.5± 2.3
Body density	1.043± 0.005	1.044± 0.006	1.032± .006	1.034± 0.005	1.026± .004	1.027± .003	1.033± 0.005	1.035 ± .004
BMI (kg/m ²)	19.94± 2.6	20.56± 2.1	23.14± 2.4	21.32± 2.3	22.60± 2.2	20.31± 1.9	21.89± 2.4	20.5 ± 2.1
Per cent body fat	23.95	23.61	27.43	27.72	31.17	31.21	27.51	27.50

was found to be 27.50, which is higher than the values reported by Emundson and Emundson (1989) as 21.1 but lower than the value reported by Barakoti and Raghuvanshi (2009) as 30. The above mentioned studies also show similarity with the data of present study that age seems to be one important factor in the per cent body fat of subjects. The lean body mass of the women ranged from 26.07kg to 43.5kg. Such a wide range in lean body mass may be because of difference in the intakes of calcium in the diet and also due to the differences in activity patterns of the subjects.

Food consumption, nutrition and health status:

Two types of dietary pattern were found among the subjects *i.e.* two meals a day in rural women and three meals a day in urban women. Most of the subjects were taking tea twice or thrice a day with or without snacks. A total of 38.3 per cent studied population was non-vegetarian (28.8% urban and 47.7% rural subjects). The results of the study revealed that anaemia and chronic energy deficiency were the major health problems of the women residing in district Uttarkashi of Garhwal region.

Among study population, 63.8 per cent women (64.4% urban and 63.3% rural) belonged to the category of normal; 18.9 per cent (11.1% urban and 26.6% rural) were low weight normal, (8.8% urban and 2.2% rural) were obese of grade I (Table 4). This prevalence was found directly related to the

calorie intake of the women. The prevalence of CED among women of Uttarkashi (8.8%) was marginally lower than the values reported by Gautam and Thakur (2009) and NFHS-3 (2007) as 45.9 per cent and 30 per cent, respectively.

Although all the subjects were consuming cereals daily (Table 5), the average calorie intake was calculated to be 1752 ± 263 kcal for urban women and 1699 ± 298 kcal for rural women (Table 6) with a wide range of 848-2564 kcal. These values were lower than RDA (ICMR, 1989). The reason for energy deficit in the subjects was due to the less consumption of cereals in their diet. The daily mean intake of cereals of urban and rural women (242.80 g and 232.18 g) with a wide range of 104-360g/day was found to be lower than the results reported by Deshpande *et al.* (2001), Rahman and Rao (2001) and Thilakavathi and Purushothaman (2002).

The main cereals and millets consumed by the subjects were wheat, rice, *ragi* (*Eleusine coracana*) and *sanwa millet* (*Echinochloa frumentacea*). Calorie intake was found to be positively but non-significantly correlated ($r=0.247$) with protein intake and per capita income (0.594 at $p=0.01$). The mean calorie intake was lower in rural women. This might be due to a busy work schedule and eating pattern of two meals a day, which is reflected in lower values for calorie intake. Pulses were the main source of protein followed by cereals for all the subjects as they were using it in various forms like *dal*, *stuffed roti*, *pakora* etc. The pulse consumption varied from 18g to 95g

Table 4. Prevalence of chronic energy (%) deficiency among women of Uttarkashi

CED grade (BMI)	16-30 years		31-45 years		46-60 years		Urban	Rural
	Urban	Rural	Urban	Rural	Urban	Rural		
CED grade III (≤ 16)	3.3	3.3	0	0	0	0	1.1	1.1
CED grade II (16-17)	10	3.3	0	6.6	0	0	3.3	3.3
CED grade I (17-18.5)	16.6	3.3	0	3.3	0	3.3	5.5	3.3
Low weight normal (18.5-20)	16.6	36.6	6.6	20	10	23.3	11.1	26.6
Normal (20-25)	50	53.3	70	66.6	73.3	70	64.4	63.3
Obesity grade I (25-30)	3.3	0	23.3	3.3	16.6	3.3	14.4	2.2

Table 5. Average food groups consumption of women of Karnataka

Food groups	16-30 years		31-45 years		46-60 years		61-80 years							
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural						
Cereals	209.06	60.80	210.03	121.71	255.80	52.71	271.66	60.07	209.20	36.16	212.80	51.61	202.13	39.71
Pulses	12.36	11.78	16.60	13.29	19.90	13.36	16.70	11.93	18.80	16.98	16.72	13.32	19.38	11.71
Oils and fats	28.83	5.11	21.75	6.65	31.50	6.21	29.80	6.52	30.73	7.03	30.35	6.11	28.70	6.60
Vegetables and fruits	219.76	65.57	220.07	57.6	211.03	52.30	218.86	53.28	236.73	61.72	233.21	60.75	207.79	52.23
Dairy foods	20.83	31.71	31.00	39.75	26.73	39.87	27.50	52.80	23.33	33.37	23.63	36.72	20.61	11.58
Eggs	28.66	32.13	20.66	23.33	21.00	23.27	16.66	22.78	19.00	23.97	17.16	22.20	17.16	22.67
Meats	67.23	35.85	63.00	30.99	70.90	30.95	57.83	23.65	66.83	27.07	50.76	18.67	57.09	27.73
Green leafy vegetables	171.86	31.73	95.00	16.71	86.20	13.57	111.0	11.27	88.10	35.03	103.23	18.96	107.11	15.63
Roots and tubers	196.13	62.72	196.66	60.32	236.70	71.07	197.10	73.72	213.16	67.52	183.70	53.65	192.76	62.76
Other vegetables	15.80	29.75	53.70	27.36	62.30	32.52	55.26	30.56	66.60	37.56	57.76	33.66	53.10	30.75
Sugar and jaggery	28.00	7.21	27.36	5.76	29.76	6.72	30.56	5.97	32.83	8.77	33.66	6.37	30.75	5.97

Table 6. Average nutrient consumption of women of Karnataka

Nutrients	16-30 years		31-45 years		46-60 years		61-80 years							
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural						
Protein (g)	78.50	11.03	78.05	12.71	90.73	8.96	83.37	8.96	85.53	12.77	80.28	10.8	81.33	9.36
Fat (g)	37.61	8.57	37.52	7.78	37.63	7.93	37.13	3.03	33.32	7.81	29.70	5.07	32.79	7.28
Energy (Kcal)	167.8	27.5	160.5	28.7	185.7	29.7	178.0	17.0	178.6.0	25.1	170.3	26.3	169.9	20.8
Calcium (mg)	277.62	37.7	277.35	68.07	333.72	77.05	297.72	73.58	318.62	60.66	303.57	52.53	309.88	57.63
Calcium (mg)	108.76	15.76	116.51	106.30	902.67	221.00	877.76	151.60	885.97	186.6	895.35	163.20	831.188.0	829.74.0
Iron (mg)	21.98	5.76	23.75	7.70	23.71	5.72	26.88	6.70	27.02	7.10	27.96	7.70	23.13	6.09
Phosphorus (mg)	183.5	32.8	190.8	73.7	218.7	55.7	232.6	73.2	216.5.0	78.7	228.71	52.0	236.2	75.6
Vitamin A (mg)	1.73	0.33	1.78	0.31	1.66	0.56	1.80	0.30	1.57	0.32	1.66	0.33	1.55	0.70
Vitamin B1 (mg)	1.30	0.23	1.26	0.26	2.36	0.36	1.39	0.27	1.37	0.27	1.38	0.23	1.67	0.27
Vitamin B2 (mg)	1.239	3.19	1.228	1.03	1.535	1.27	1.509	3.60	1.527	3.72	1.676	3.79	1.733	3.71
Vitamin C (mg)	85.77	18.13	86.70	38.20	119.07	12.12	103.5	12.0	16.05	11.0	80.0	32.50	92.52	73.78

with an average daily consumption of 46.22 g in urban subjects and 49.38g in rural subjects. Some underutilized pulses consumed by the subjects were *Gahat (Dolichos biflorus)*, *raeins (Vigna umbellata)* and *bhatt (Glycine max)*. The average protein intake of women of Uttarkashi was 50.8 with mean protein intake of 50.28g for urban subjects and 51.32 g for rural subjects (Table 6).

The prevalence of anaemia was checked by estimating the haemoglobin concentration. Prevalence of anaemia in the study population was found to be 85 per cent with haemoglobin level ranging between 6.2 to 12.8 g/dl and with an average of 9.71 ± 1.7 g/dl for urban subjects and 10.48 ± 1.79 g/dl for rural subjects (Table 7). Among the rural women, mild anaemia was more prevalent whereas among the urban women, moderate form of anaemia was more prevalent.

The prevalence of anaemia was higher among the rural women of district Uttarkashi than the values reported by Upadhyay *et al.* (2004), Pathak *et al.* (2003), Chaturvedi *et al.* (1996) and Sidramshettar (2003) and NFHS-3. Anaemia was prevalent with such a high percentage although the range of consumption of iron and vitamin C was very wide among the study population. Anaemia among the women of Uttarkashi may be attributed to inadequate dietary intake, illiteracy, and poor access to health services.

The average iron intake of urban and rural subjects was 23.13mg and 25.19mg with the per cent adequacy of 77.1 ± 14.4 and 83.96 ± 12.2 for urban and rural subjects, respectively. Only 18.8 per cent urban and 26.6 per cent of rural subjects were able to meet iron requirement. A positive and significant correlation ($r = 0.699$, $p = 0.01$) was found between the iron intake and haemoglobin status of the subjects. In the study, whole pulses and green leafy vegetables consumption was also seen to be on higher side. Green leafy vegetables consumption varied from 0-200 g/day with an average consumption of 84.38 and 104.11g urban and rural subjects, respectively. The main green leafy vegetables used by the subjects were spinach (*Spinacia oleracea*), *oogal (Fagopyrum esculentum)* and radish leaves (*Raphanus sativus*).

The consumption of ascorbic acid was found to be more than twice the RDA in majority of the subjects due to inclusion of green leafy vegetables like cabbage and radish leaves as well as sufficient amount of fruits in the subjects' diet. Majority of urban (91.2%) and rural subjects (89%) were consuming fruits with frequency of more than twice per week. The mean

fruit intake was found to be 68.38g for urban subjects and 57.09g for rural subjects. The consumption of green leafy vegetables was found more in rural women as a large portion of rural subjects were growing them in their kitchen gardens and also the urban subjects were getting them at cheaper rates. On the basis of above observations on iron intake it can be said that worm infestation, poor iron absorption and assimilation and poor hygiene may also have contributed towards high prevalence of anaemia.

Clinical observation didn't show any frank clinical symptoms of vitamin A deficiency. The average daily consumption of β -carotene was found higher in rural subjects (2780 μ g) than urban women (2362 μ g). A statistically significant difference was found as daily intake of β -carotene of urban and rural women of age group 31 to 45 years. The per cent adequacy of β -carotene was 98.4 ± 22 μ g for urban subjects and 115.83 ± 36 μ g for rural subjects. A total of 45 per cent urban and 60 per cent rural subjects were consuming β -carotene more than the RDA whereas 26.6 per cent and 19.9 per cent of urban and rural subjects were having their $\hat{\alpha}$ -carotene intake between 75-100 per cent of RDA. The intake of $\hat{\alpha}$ -carotene of the study area was higher than the results given by UNICEF (1995). The average consumption of milk and milk products was 233.27 ± 60.75 and 237.79 ± 52.23 g for urban and rural subjects with a range of consumption between 90-480 g. Most of the subjects were consuming milk in the form of tea that was being taken twice or thrice per day by all the subjects. It is also important to mention here that this study was carried out during winters and that may be the reason for higher consumption of milk by the subjects.

The results of the study did not show any vitamin B complex and vitamin C deficiency. Majority of the urban and rural subjects were consuming thiamine (94.4% and 93.3%) and riboflavin (84.4% and 48.8%) above the RDA. Niacin was being consumed above the RDA by only 67.7 per cent urban and 46.6 per cent rural subjects. Wheat, *ragi* and pulses were the main sources of thiamine and milk and milk products and green leafy vegetables were the major sources of riboflavin for the subjects. The data of study revealed that 94.4 per cent urban and 95.5 per cent rural subjects were consuming adequate calcium. The average calcium intake of both urban and rural women was twice of the RDA *i.e.* 831mg and 829mg, respectively. The higher intake of calcium was due to the inclusion of milk, green leafy vegetables and carrot etc in the

Table 7. Classification of subjects (%) according to mean haemoglobin level

Degree of anaemia (Hb. level in g/dl)	16-30 years		31-45 years		46-60 years		Urban	Rural
	Urban	Rural	Urban	Rural	Urban	Rural		
Severe (≤ 7)	13.3	10	13.3	0	6.6	3.3	11.1	4.4
Moderate (7-10)	53.3	26.6	46.6	26.6	23.3	20	41.1	24.4
Mild (10-12)	23.3	50	30	46.6	53.3	63.3	35.5	53.3
Non-anaemic (≥ 12)	10	13.3	10	26.6	16.6	13.3	12.2	17.7

diet of the subjects. *Eleusine coracana* and *Glycine max* were also contributing a considerable amount of calcium to the diet of rural subjects as most of the subjects were consuming them daily or twice per week.

In the present study, the consumption of green leafy vegetables, other vegetables, roots and tubers, milk and milk products and sugar and jaggery was found higher than the results reported by Deshpande *et al.* (2001), Rahman and Rao (2001) and Thilakavathi and Purushothaman (2002) whereas consumption of pulses and fats and oils in Uttarkashi was higher than the results reported by Rahman and Rao (2001) and Thilakavathi and Purushothaman (2002). Among underutilized foods, *gadari* (*Colocasia esculenta*), *laai* (*Brassica oleracea*), *madira* (*Echinochloa colona*), *jakhiya* (*Pulpanisia viscosa*) were used during the study period. "Batani", "Tilantha", "Til ki roti", and "Chhoari" were some of the traditional foods mainly consumed during the winter season as they were considered 'hot' by the study population. All the underutilized and traditional foods were very nutritious (Raghuvanshi and Verma, 2001 and Raghuvanshi, 2003) and were being consumed more frequently by the rural women.

Clinical observations showed that 6 per cent urban and 18 per cent rural subjects had swollen red gums. A total of 16.6 per cent urban and 33.3 per cent rural subjects had dry, discoloured and lusterless hair indicating protein deficiency. Dry and rough skin was seen in 8.8 per cent urban and 35.5 per cent rural subjects. Mottling of teeth was seen in 37.7 per cent urban and 42.2 per cent rural subjects. The clinical signs might be due to the poor oral hygiene of the subjects along with the low fluorine content of water. The data collected on the prevalence of various infectious diseases in the subjects during previous one month showed that urban subjects had higher prevalence of common cold and cough (84.4%) and fever (33.3%) as compared to rural subjects (74.4% for cold and cough and 28.8% for fever, respectively). Reasons for the prevalence of these infectious diseases may be the poor immunity, micronutrient deficiency, poor hygienic conditions and lack of nutrition education.

Conclusion:

The results of the present study revealed that the mean consumption of cereals, fats and oils, eggs, fruits, roots and tubers and other vegetables was higher in urban subjects than their rural counterparts whereas the mean consumption of pulses, milk, GLVs and sugar was higher among the rural population. In both urban and rural subjects, average intake of protein, fat, calcium, thiamine, riboflavin, niacin and ascorbic acid was higher than the RDA. Nutritional knowledge was lower among the rural women than the urban women. CED and obesity were more prevalent among the urban women which shows the good environmental and nutrition status of rural women. Anaemia was prevalent among 85 per cent of the study

population with comparatively higher percentage of severely anaemic women in the urban areas. For control of iron-deficiency anaemia measures need to be taken to improve bioavailability and to reduce blood loss by infections.

On the basis of above results, it can be concluded that nutrient intake of rural and urban women was almost similar. Dietary variations were very high, therefore, average intake of nutrients was found close to RDA. Under nutrition is less prevalent but micronutrient deficiencies still exist to a segment of population. Local vegetation still exists, being more consumed by the rural population but the knowledge about its consumption is on the decline. This emphasizes the need to impart education to the women for maintaining traditional food pattern, which can help in preventing nutritional diseases, and also maintaining the biodiversity of the region. It can be suggested that the intake of underutilized and traditional foods should be promoted for nutritional security at the household level.

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