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Research Article

Macro-nutrient intake of reproductive age group women: findings of a community based study from rural Varanasi

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ABSTRACT

Background: Indian rural women are in a disadvantaged position on nutritional scale due to variety of reasons including inadequate consumption of macronutrients. With this background, a comprehensive dietary assessment of macro-nutrient (energy, protein, and fat) intake of rural women of reproductive age group was contemplated with the objectives: (a) to assess macro nutrients (energy, protein, and fat) intake of study subjects, and (b) to pin point the correlates of their macro nutrients intake.
Methods: This study was conducted in a Community Development Block of Varanasi district of Uttar Pradesh adopting a community based cross sectional study design. Non pregnant women of reproductive age group (15-49 years) were considered as subjects of this study and the required sample size (610) was selected by adopting multi stage random sampling procedure. Socio-demographic characteristics were obtained by interview technique and dietary intake was assessed by 24 hour oral recall questionnaire method.
Results: The average energy, protein and fat intakes were 1657.81 ±461.91 Kcal/day, 45.05 ±18.79gm/day, and 37.52 ±31.16 gm/day, respectively. With respect to Nutrient Adequacy Ratio of these macro-nutrients, the values were 84.4%, 81.82% and 55.54% of respective estimated RDAs. Socioeconomic status (SES) exerted a significant ($p<0.05$) influence in all these three macro-nutrient consumption. Along with SES, age of study subjects was also found to be significantly ($p<0.05$) associated with protein intake and castes of study subjects were found to be significantly ($p<0.05$) associated with daily fat intake as well.
Conclusions: Well developed nutrition education programmes for women are needed to ensure adequate consumption of macro-nutrients.

Keywords: Macro-nutrient intake, Rural women, Reproductive age group

INTRODUCTION

Nutrition is directly linked to the human resource development, productivity and prosperity of a country. It is the focal point of health and well being. Health status of any individual or a community is directly indicated by the nutritional status of the particular individual or community.[1] Over 225 million Indians remain chronically undernourished.[2] India's malnutrition and Chronic Energy Deficiency (CED) figures are not coming down despite a number of government programmes. As per NFHS-2 (1998-99)[3] and NFHS-3(2005-06)[4], there have been marginal changes in child malnutrition and CED in women over a period of seven years. There are about 800 million people undernourished in the world. Most of them live in developing country, about 30% each in southern and eastern Asia, 25% in sub- Saharan Africa, and 8% in Latin America and the other Caribbean.[5]

Chronic Energy Deficiency results when the body needs for energy fuels (carbohydrate, fat, protein) cannot be met by the diet. It includes a wide spectrum of clinical

manifestations conditioned by relative intensity of energy deficit, the severity and duration of deficiencies, the age of the host, the cost of the deficiency, and the association with other nutritional or infectious diseases. Its severity ranges from weight loss or growth retardation to distinct clinical syndromes, frequently associated with minerals and vitamins.

Women play a vital role in providing food and nutrition for their families through their roles as food producers, processors, traders and income earners. Insufficient food supplies are a major cause of malnutrition in technically under developed countries. Small farm agriculture in these areas frequently does not yield enough food to meet the full needs of the family, much less the surplus for distribution, and most imported foods are too expensive for the majority of the families. There are many foods that are readily available in tropical areas that have relatively low concentration of essential nutrients, the staple foods in these areas do not contain sufficient protein to meet requirements and also quality of these foods is generally poor. Some species of corn may have a protein concentration of 10%, and their biological value is less than 50%. Even in legumes the percentage of protein does not usually exceed 25%, and after the correction is made for the quality, this is reduced to less than 15% of utilizable protein. Because of dilution with water, cooking lowers further the utilizable protein concentration. Animal foods are the best protein sources, but they tend to be expensive, not always available, or prohibited by religious practices.

Seventy four percent of Indian population lives in rural areas. Inter and intra state disparity is visible across the country in term of health, nutrition, fertility, and educational status. Thus urban areas are always ahead of rural areas in terms of different aspects of development.[6] Therefore; nutritional status of Indian women is also very poor. In 2005-06, 34.2% women of reproductive age group of Uttar Pradesh were found to be chronically malnourished whereas this was 37.2% for those residing in rural areas.[4] With this background, in present study a comprehensive dietary assessment of macro-nutrient (energy, protein, and fat) intake of rural women of reproductive age group was contemplated with the following specific objectives:

a. To assess macro nutrients (energy, protein, and fat) intake of study subjects and their adequacy.
b. To pin point the correlates of macro nutrients intake.

METHODS

This study was conducted in rural areas of Varanasi. Varanasi is often called cultural capital of India. The district lies in the eastern part of Uttar Pradesh state. Total population of district is 3682194 of which 56.57 % is rural. The literacy rate of district is 77.05% (male 85.12% female 68.20%) and the overall sex ratio for the district is 909.[7] A community based cross sectional design was adopted and women of reproductive age group (15-49 years) were considered as sample for this study. Pregnant and seriously ill women were excluded. Computation of required sample size of 576 was based on the assumption that prevalence of CED in the rural reproductive age group women is around 40% and permissible level of error as 10% of the prevalence rate. Taking an additional sample of 5% for drop outs required sample size became 605.04 which were rounded to 610. The required sample was selected by adopting multi stage sampling. Following stages were involved in the selection of study subjects:

Stage 1:

In the first stage, one commisionary of Uttar Pradesh state (comprising of 7 districts) was selected randomly. From the selected commisionary, one district (viz. Varanasi) was selected randomly.

Stage 2:

One Community Development (CD) block (i.e. Chiraigaon) was selected from eight CD blocks of Varanasi district by simple random sampling method.

Stage 3:

In this stage, 5 villages out of 84 revenue villages were selected further by systematic random sampling. The selected villages were *Bariyasanpur*, *Dubkiyan*, *Narayanpur*, *Tilmapur*, and *Umraha.*

Stage 4:

In the selected villages subjects were selected by adopting probability proportion to size (PPS). In order to get required study subjects (610), systemic random sampling (every seventh household) was done.

Stage 5:

From each household one study subject was selected for study.[8] In case there were more than one eligible subjects in a household, one subject was selected by lottery method.

The study had prior approval of the academic and governing bodies of Banaras Hindu University, Varanasi, India and prior consent was taken from the study subjects for participation in this study.

The present investigation is a kind of field study in which primary tool used was a predesigned and pre-tested interview schedule for recording of family as well as information pertaining to the individuals considered for the study. Each study subject was subjected to dietary assessment. The dietary assessment of study subjects was done by using 24 hour dietary recall oral questionnaire method. Macro nutrient intake of each subject was

computed in terms of daily intake of energy, protein and fat. Standard utensils (e.g. bowls for measuring cooked rice, dal, curd, vegetables, milk etc.; spoon for measuring oil, sugar etc.) were used for measuring the approximate intake of different food items. Dilution factor of liquid food such as *dal* was also noted. Diet survey was not conducted on the day after any festival or any other special occasion. Data pertaining to 5% of samples were cross checked by the other researcher for quality assurance.

Data thus collected was entered in personal computer. Statistical Package for Social Sciences (SPSS 16th version) and Microsoft Excel (2007 version) were used for analysis. Intake in terms of energy, protein, and fat were computed as per Nutritive Value of Indian Foods.[9] Nutrient Adequacy Ratio (NAR) was calculated by comparing with corresponding Recommended Dietary Allowances (RDA) recommended by ICMR, 2010.[9] In order to identify absolute contribution of influencing factors logistic regression was applied. The other statistics incorporated in this study included Mean ± SD, Confidence Interval (CI) and ANOVA with 'post hoc' test.

RESULTS

Macro nutrient intake of study subjects is given in Table 1. Average energy, protein and fat intakes were 1657.81±461.91 Kcal/day, 45.05±18.79 gm/day, and 37.52±31.16 gm/day, respectively. With respect to NAR of these macro-nutrients, the values were 84.4%, 81.82% and 55.54% of respective estimated RDA.

Table 1: Macro nutrient intake of study subjects.

Macro Nutrients	RDA*	Mean (SD)	CI (95%)	NAR (%)
Energy (Kcal/d)	S-1900 M-2230 H-2850	1657.81 (±461.91)	1621.15-1694.47	84.40
Protein (g/d)	55	45.05 (±18.79)	43.55-46.54	81.82
Fat (g/d)	S-20 M-25 H-30	37.52 (±31.16)	35.04-40.00	55.54

* Recommended Dietary Allowances for Indian women (2010).[9]

Distribution of study subjects according to NAR of energy (Kcal/day) with respect to RDA is given in Figure 1**.** In case of 14.6% subjects daily calorie consumption was <50% of RDA whereas 37.4% subjects had calorie consumption ≥RDA.

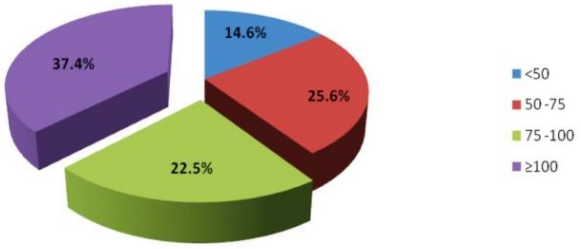

Figure 1: Distribution of study subjects according to Nutrient Adequacy Ratio (NAR) of energy (Kcal) w.r.t. RDA.

In all 257 (42.13%) subjects had protein intake ≥ 80% of RDA. Protein consumption was <50% of RDA in 12.5% subjects (Table 2). In the present study, study population was heterogeneous in terms of consumption of fat. One hundred forty six (23.93%) had percentage intake of fat with respect to RDA <50% whereas 58.7% subjects had fat consumption ≥RDA (Figure 2).

Table 2: Distribution of study subjects according to NAR of Protein w.r.t. RDA.

NAR	N	Percent
<50	76	12.5
50-59.99	133	21.8
60-69.99	76	12.5
70-79.99	68	11.1
80-89.99	38	6.2
90-99.99	28	4.6
≥100	191	31.3
Total	610	100.0

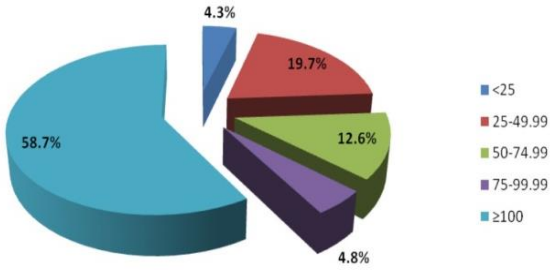

Figure 2: Distribution of study subjects according to Nutrient Adequacy Ratio (NAR) of fat (visible) w.r.t. RDA.

Calorie intake of study subjects according to their socio-demographic characteristics is given in Table 3. None of the variables (viz. Age, religion, caste, type of family, marital status, educational status, primary occupation of subjects and maximum education and main occupation of the family) except socio-economic status (SES) were significantly associated with energy intake.

Table 3: Energy intake (Kcal/day) of study subjects according to their socio-demographic characteristics.

Sr. no.	Variables	N	Mean (SD)	F	P
1	Age of the subjects (in years)				
	15-24	219	1685.82 (±445.01)	1.440	0.230
	25-34	196	1628.11 (±471.27)		
	35-44	151	1626.90 (±484.14)		
	≥45	44	1756.77 (±414.17)		
2	Religion				
	Hindu	566	1655.62 (±460.77)	0.176	0.675
	Muslim	44	1685.94 (±480.87)		
3	Caste				
	SC & ST	191	1651.21 (±467.56)	0.130	0.878
	OBC	285	1653.84 (±471.77)		
	Others	134	1675.66 (±434.72)		
4	Type of family				
	Nuclear	320	1661.42 (±477.39)	0.021	0.979
	Joint	260	1654.09 (±442.45)		
	Three generation family	30	1651.50 (±474.24)		
5	Marital status of subjects				
	Unmarried	159	1666.27 (±456.47)	0.055	0.947
	Married	436	1654.05 (±466.87)		
	Widow & separated	15	1677.49 (±393.88)		
6	Educational status of subjects				
	Illiterate	206	1649.23 (±494.45)	0.526	0.757
	Primary	70	1712.09 (±418.34)		
	Middle	90	1639.91 (±463.93)		
	H. School	86	1689.64 (±442.89)		
	Intermediate	93	1664.66 (±420.90)		
	Graduate or above	65	1599.43 (±484.93)		
7	Primary occupation of subjects				
	Housewife	386	1648.94 (±470.46)	0.348	0.884
	Domestic worker	36	1603.36 (±479.10)		
	Agriculture labor	19	1672.01 (±476.95)		
	Service	11	1618.57 (±350.96)		
	Student	130	1698.18 (±433.84)		
	Skilled worker	28	1668.51 (±49.29)		
8	Socio-economic status				
	Upper class	33	1567.21 (±479.08)	6.287	0.000
	Upper middle class	56	1613.26 (±406.88)		
	Middle class	100	1765.57 (±442.72)		
	Lower middle class	199	1742.58 (±427.16)		
	Lower class	222	1557.10 (±488.63)		
9	Maximum education in the family				
	Illiterate	19	1472.13 (±520.62)	1.825	0.092
	Upto primary	68	1716.37 (±461.34)		
	Upto junior high school	82	1587.73 (±532.80)		
	Upto high school	120	1714.64 (±442.54)		
	Upto intermediate	132	1704.19 (±433.19)		
	Upto graduation	126	1628.24 (±426.33)		
	Above graduation	63	1595.54 (±489.85)		
10	Main occupation of head of the family				
	Farmer	78	1587.96 (±471.30)	1.244	0.291
	Labor	228	1684.89 (±469.15)		
	Service	137	1611.53 (±497.80)		
	Business	96	1702.95 (±381.16)		
	Skilled worker	71	1675.87 (±452.056)		

Table 4: Protein intake (gm/day) of study subjects according to their Socio-demographic characteristics.

Sr. no.	Variables	N	Mean (SD)	F	P
1	Age of the subjects (in years)				
	15-24	245	46.1 (±17.53)	3.137	0.025
	25-34	170	41.4 (±15.93)		
	35-44	151	47.1 (±23.33)		
	≥45	44	46.42 (±16.91)		
2	Religion				
	Hindu	566	45.04 (±18.83)	0.002	0.966
	Muslim	44	45.16 (±18.51)		
3	Caste				
	SC & ST	191	42.94 (±22.55)	1.755	0.174
	OBC	285	46.06 (±17.25)		
	Others	134	45.89 (±15.68)		
4	Type of family				
	Nuclear	320	45.83 (±18.06)	1.234	0.292
	Joint	260	43.75(±19.94)		
	Three generation family	30	47.86 (±15.69)		
5	Marital status of subjects				
	Unmarried	159	47.26 (±17.60)	1.517	0.220
	Married	436	44.23 (±19.29)		
	Widow & separated	15	45.27 (±15.13)		
6	Educational status of subjects				
	Illiterate	206	45.76 (±22.52)	0.257	0.956
	Primary	70	44.53 (±17.61)		
	Middle	90	43.48 (±16.58)		
	H. School	86	46.29 (±17.67)		
	Intermediate	93	44.37 (±16.34)		
	Graduate	50	44.49 (±14.50)		
	PG or above	15	45.91 (±15.36)		
7	Primary occupation of subjects				
	Housewife	386	44.39 (±19.46)	1.262	0.279
	Domestic worker	36	40.59 (±16.84)		
	Agriculture labor	19	46.18 (±17.51)		
	Service	11	42.72 (±14.96)		
	Student	130	48.14 (±17.67)		
	Skilled worker	28	45.63 (±18.39)		
8	Socio-economic status				
	Upper class	33	35.72 (±4.06)	7.191	0.000
	Upper middle class	56	42.69 (±9.03)		
	Middle class	100	48.91 (±18.96)		
	Lower middle class	199	48.84 (±18.04)		
	Lower class	222	41.88 (±21.31)		
9	Maximum education in the family				
	Illiterate	19	42.91 (±18.25)	0.702	0.648
	Upto primary	68	45.58 (±18.49)		
	Upto junior high school	82	43.24 (±19.13)		
	Upto high school	120	46.1 (±18.27)		
	Upto intermediate	132	46.77 (±23.85)		
	Upto graduation	126	42.98 (±14.17)		
	Above graduation	63	45.99 (±15.94)		
10	Main occupation of head of the family				
	Farmer	78	46.79 (±15.47)	0.536	0.709
	Labour	228	45.58 (±22.64)		
	Service	137	43.23 (±16.97)		
	Business	96	45.08 (±14.40)		
	Skilled worker	71	44.88 (±17.19)		

Table 5: Fat intake (gm/day) of study subjects according to their socio-demographic characteristics.

Sr. no.	Variables	N	Mean (SD)	F	P
1	Age of the subjects (in years)				
	15-24	245	38.34 (±30.98)	1.735	0.159
	25-34	170	33.14 (±28.05)		
	35-44	151	40.66 (±34.54)		
	≥45	44	39.15 (±30.57)		
2	Religion				
	Hindu	566	37.56 (±31.05)	0.011	0.917
	Muslim	44	37.05 (±32.96)		
3	Caste				
	SC & ST	191	32.23 (±33.85)	4.084	0.017
	OBC	285	39.68 (±30.83)		
	Others	134	40.49 (±26.84)		
4	Type of family				
	Nuclear	320	39.36 (±30.52)	2.356	0.096
	Joint	260	34.54 (±31.96)		
	Three generation family	30	43.76 (±26.11)		
5	Marital status of subjects				
	Unmarried	159	39.54 (±31.15)	0.468	0.627
	Married	436	36.76 (±31.27)		
	Widow & separated	15	38.26 (±29.07)		
6	Educational status of subjects				
	Illiterate	206	38.31 (±34.82)	0.433	0.857
	Primary	70	36.04 (±31.49)		
	Middle	90	34.60 (±29.11)		
	H. School	86	40.65 (±31.07)		
	Intermediate	93	36.15 (±28.19)		
	Graduate	50	37.12 (±25.82)		
	PG or above	15	43.06 (±24.82)		
7	Primary occupation of subjects				
	Housewife	386	36.68 (±31.13)	0.537	0.748
	Domestic worker	36	33.09 (±28.86)		
	Agriculture labor	19	39.82 (±32.82)		
	Service	11	37.61 (±27.41)		
	Student	130	40.96 (±31.42)		
	Skilled worker	28	37.35 (±34.56)		
8	Socio-economic status				
	Upper class	33	23.45 (±3.84)	19.004	0.000
	Upper middle class	56	35.23 (±9.09)		
	Middle class	100	45.66 (±32.11)		
	Lower middle class	199	48.79 (±31.56)		
	Lower class	222	26.43 (±31.63)		
9	Maximum education in the family				
	Illiterate	19	38.83 (±30.38)	0.694	0.654
	Upto primary	68	37.89 (±33.79)		
	Upto junior high school	82	36.66 (±33.02)		
	Upto high school	120	39.39 (±32.66)		
	Upto intermediate	132	38.45 (±35.28)		
	Upto graduation	126	33.05 (±24.65)		
	Above graduation	63	41.31 (±25.39)		
10	Main occupation of head of the family				
	Farmer	78	39.02 (±28.23)	0.156	0.960
	Labor	228	36.57 (±35.77)		
	Service	137	37.21 (±27.92)		
	Business	96	39.01 (±25.51)		
	Skilled worker	71	37.54(±31.88)		

In comparison to these groups calorie intake was significantly more in subjects belonging to middle class (1765.57±442.72 Kcal/day). Calorie intake of lower middle class (1742.58±427.16 Kcal/day) was significantly more than upper and lower classes. Post Hoc test also revealed that calorie intake of middle class was significantly more than upper middle class. Calorie intake of subjects having maximum education in the family as illiterate, up to Junior High School and above graduation was 1472.13±520.62, 1587.73±532.80 and 1595.54±489.85 Kcal/day, respectively. In other categories energy intake of subjects were more than 1600 Kcal/day. However, there existed no significant association between average calorie intake and maximum education in the family.

Age and socio-economic status of study subjects were found to be significantly ($p<0.05$) associated with protein intake (Table 4). The average protein intake in 15-24 years age group was 46.1±17.53 gm/day. Corresponding value for 25-34 years, 35-44 years and ≥45 years age groups were 41.4±15.93gm/day, 47.1±23.33 gm/day and 46.42±16.91 gm/day, respectively. The post-hoc test revealed that in comparison to 15-24 years and 35-44 years age group subjects' daily protein intake of 25-34 years age group was found to be significantly ($p<0.05$) less.

The average daily intake of protein (gm/day) for upper class was found to be 35.72 ±4.06 and corresponding value for upper middle class, middle class, lower middle class and lower class were 42.69±9.03, 48.91±18.96, 48.84 ±18.04 and 41.88±21.31, respectively. The post hoc test revealed that in comparison to upper and upper middle and lower class, protein intake of middle and lower middle classes were significantly ($p<0.05$) more; in comparison to middle class and lower middle class protein intake of lower class was ($p<0.05$) less. There was no significant ($p>0.05$) difference in protein intake of subjects from upper, upper middle and lower classes.

The other insignificant variables for protein intake were religion, type of family, marital status, educational status and primary occupation of subjects, maximum education in the family and main occupation of head of the family.

Except caste and SES no other socio-demographic characteristics of study subjects were significantly ($p<0.05$) associated with daily fat intake (gm/day). The lowest average fat intake was found to be in Scheduled Caste (SC) & Scheduled Tribes (ST) caste category (32.23±33.85gm/day). For subjects belonging to other backward class (OBC) and others castes the average values were 39.68±30.83 gm/day and 40.49±26.84 gm/day, respectively (Table 5). The post hoc test revealed that in comparison to SC & ST category fat intake was significantly ($p<0.05$) more in OBC and other castes. Fat intake was similar in OBC and other caste categories.

The average fat intake among subjects belonging to upper and upper middle class were 23.45 ±3.84 and 35.23±9.09 gm/day, respectively; corresponding values for middle, lower middle and lower classes were 45.66±32.11, 48.79±31.56 and 26.43±31.63 gm/day, respectively. The post hoc test revealed that in comparison to upper and upper middle class as well as lower class daily fat intake was significantly ($p<0.01$) more in subjects belonging to middle and lower middle classes. In comparison to upper middle and lower middle classes, fat intake of subjects from lower class was found to be significantly ($p<0.05$) less. In comparison to upper class with upper middle and lower classes, and middle class with lower middle class, there existed no significant ($p>0.05$) difference in daily fat intake of subjects.

DISCUSSION

The constitution of India as well as preamble of World Health Organization (WHO), emphasized on raising health and nutritional status of women of reproductive age group. A normal healthy women gains about 12 kg during pregnancy but poor rural Indian women on an average gain 6.5 kgs only so under nutritional stress coupled with lactation, leads to chronic under nutrition of mother and child both. A considerable proportion of women of Uttar Pradesh state have a body mass index (BMI) less than 18.5 kg/m^2 indicating high prevalence of nutritional deficiency. Mainly low BMI women are found in rural areas, among uneducated women and scheduled caste and scheduled tribes group and in the families with low standard of living index.[4] Indian women were disadvantage socially, educationally and economically and were excluded from Indian society until the government recognized the groups formally in the 1930s.

In comparison to the findings of the present study, lower intake of energy and protein have been reported in a study conducted on non-pregnant and non-lactating (NPNL) rural women of reproductive age group (18-40 years). They reported energy intake to be 52-53% of RDA which is lower than the figure of 84.4% by subjects of present study.[10] In an another study by Mittal[11] the mean energy and protein intake was found to be 983.60 (±309.6) kcal/day and 27.33 (±8.2) gm/day, respectively which met only 50% of the nutrient requirements.

The National Nutrition Monitoring Bureau (NNMB) surveys of India provided data on time trends in dietary intake by 24 hours dietary recall and nutritional status of the population in eight states from 1975 to 2005. NNMB surveys indicated that there had been reduction in energy and protein intake except among the poor; over all there had been a small decrease in total energy and protein intake in both urban and rural areas. However, the average energy (1834±485 kcal) and protein intakes (49.4±16gm) of subjects were more than the present study.[12]

In present study socioeconomic status exerted significant influence on calorie consumption of study subjects; this was maximum in middle class in comparison to lower middle and lower classes. In comparison to present study average energy intake has been observed more in subjects of a Brazilian study. The results of the latter study showed that in comparison with the lowest quartile of income, individuals with special reference to females in the highest income quartile had greater mean intakes of energy, added sugar, alcohol, animal protein, total fat, saturated fat, monounsaturated fat and Trans fat.[13]

It is possible that in a community where women of reproductive age group are having less macro nutrient intake, the similar picture may prevail for adolescent girls as well. This is substantiated by a study conducted on rural adolescent girls of Varanasi district which revealed that more than two third adolescent girls had inadequate intake of calorie, protein and fat and average intakes of macro and micronutrients (except vitamin A) in comparison to RDA.[14]

In a cross sectional study on dietary intake and rural urban migration in India, it was found that median energy intake in the rural, migrant and urban women groups was 2153, 2504, and 2644 kcal/day, respectively. Differences between these groups in proportion of energy from macronutrients were small but migrant and urban women had a higher proportion of energy from fat, and protein than rural women, and a lower proportion from carbohydrates. Migrant women had similar proportions of energy from saturated fat as rural women.[15] In spite that measuring parameter were different, it appears that macro nutrient intake have been more than the observed value in present study.

Another study on women and nutrition in Himalayan region revealed that the average energy intake per capita per day was found to be 1942.2 kcal, which was 21.78% below the standard requirement.[16] The average per capita, per day protein intake was found to be 49.25 grams which was 20.56% below the standard requirement of 62 grams. The average fat intake per capita per day was found to be 29.81 grams which was 6.84% below the standard requirement of 32 grams. In comparison to the present study calorie and protein intakes were more in subjects of Himalayan region whereas fat intake was low.

An African study on dietary intakes and body mass indices of NPNL women from the coastal and guinea savannah zones of Ghana showed that significantly more women in the Guinea Savannah zone did not meet their Estimated Average Requirements (EAR) for protein (81%), compared to women in the Coastal zone (44%).[17]

Apart from these findings castes and age of the rural women had significant influence on energy intake. A study on rural women in Azamgarh district of Uttar Pradesh revealed that one third of upper caste females had energy intake less than 80% of the required level while as high as 80% females of SC/ST belonged to this category and in the community, around half of the females consumed only that much amount of food which was not sufficient to put them even in the category of energy intake equivalent to 80% of the energy expenditure.[18]

Adverse dietary situation prevailing during adolescence exerts significant influence on nutritional status of women of reproductive age group. A study from rural setting of Varanasi district on macro nutrient intake of adolescent girls[19] showed that average calorie consumption in age groups 15-17 and 18-19 years were 1690.9±488.6, and 1648.1±366.2 kcal/day, respectively. In case of 7.8% and 4.4% subjects belonging to age groups 15-17 and 18-19 years and in all, 9.5% subjects had calorie consumption <50% of RDA. There existed significant association between calorie consumption and age of the subjects.

In contrast to the findings of present study, average energy intake of subjects in the study of Walia[20] has been observed to increase with increase in age. In the age group 30-35 years, females on an average consumed 2098.6 kcal/day in their daily diet that increased to 2238 kcal in the age group 45-50 years, this demonstrated an increase of 6.67%. Administration of ANOVA tests to the daily dietary energy intake data of different groups revealed the existence of significant differences between the various age groups. Further exploration with the Schaeffe post Hoc test recognized significantly greater intake of daily dietary energy intake values by females belonging to the higher groups as compared to the lower age groups.

Present study showed a significant ($p<0.05$) association between age and socio-economic status of study subjects with their protein intake. The results showed an increase of protein intake among subjects with the increase of their age (except in subjects of 25-34 years) and in comparison to subjects belonging to middle class and lower middle class protein intake of lower class was ($p<0.05$) less. In an another study on adolescent girls of rural Varanasi the average protein intake was 28.2 ±22.4 gm/day for 15-17 years age group and 26±21 gm/day for 18-19 years age group. Except this there also existed a significant ($p<0.01$) difference in caste wise protein intake of study subjects; 22% SC, 7.5% OBC and 12.7% others caste category subjects had protein intake <50% of RDA.[19] In a study on Indian girls belonging to deprived and disadvantaged communities, a lower energy (1460.5 Kcal) and protein (30.6 gm) intake was found.[21]

Fat intake among the subjects of the present study showed a significant ($p<0.05$) association with caste and SES. The lowest average fat intake was found to be in SC & ST caste category and almost similar daily fat intake was found to be in subjects belonging to OBC and other caste categories. Along with the castes, fat intake of study

subjects was found to be less in subjects belonging to lower SES.

According to Nagamani in her study on nutritional status of rural young women the majority of rural young women are not only undernourished but also short stature and emaciated. [22] Results demonstrated that the diets of rural forward class women is relatively better than the rural scheduled class women but the intakes of all women were poor when compared to RDA, both the groups of young women met only 40 to 50 percent of RDA.

In an another study on nutritional vulnerability of women and children in Sahariya tribal community of Madhya Pradesh, India the observed calorie, fat, vitamin A, riboflavin, vitamin C and folic acid intake among women was lower than recommended dietary allowances. The mean energy intake of Sahariya women (15-49 years) was1478 kcal which was 33.8% deficit and the mean fat intake was 12.9 g which was 26.3% deficit with respect to RDA.[23]

Some other findings pertaining to adolescent girls from rural Varanasi showed that in case of 20% subjects fat consumption was <50% of RDA. In age group of 15-17 years 15.6% subjects had fat consumption below <50% of RDA, whereas this was 12.1% in age group of 18-19 years; 22.1% subjects going to school and 11.5% subjects who left school had fat consumption <50% of RDA. Fat consumption <50% was maximum in students (22.1%) followed by subjects engaged in domestic (8.7%) and other work (13%). There existed significant association between fat consumption and age, literacy and main occupation of study subjects.[19]

CONCLUSION

In spite of the fact that average macro nutrient intakes are less than the estimated RDAs, there is considerable proportion of subjects occupying extreme positions on the scale of macro nutrient intake and therefore targeted nutrition education programmes are desired in this area to combat problems of under and over nutrition in the women of reproductive age group.

There had been wide variation in the intake of macro nutrient by women of reproductive age group of the study area. This calls for targeted nutrition education initiatives to reduce the problem of mal nutrition in this age group.

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