



RESEARCH ARTICLE

ANALYSIS OF NUTRIENT INTAKE AND HEALTH STATUS OF THE ADOLESCENT GIRLS AND ADULT FEMALES OF RURAL AREAS IN DARJEELING DISTRICT

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ABSTRACT

Present study was conducted on the rural females with the objective to assess their diet pattern, nutrient intake, nutrient deficiency, energy deficiency levels followed by recommendations for nutritional improvement. A household survey was conducted by questionnaire method on 400 rural poor families of Phansidewa block under Darjeeling district of West Bengal state to measure the various attributes related to the dietary intake. The average nutrient intake of the females is much less than the Recommended Dietary Allowances. The energy deficiency is highest in non-pregnant group. Females having serious levels of deficits in protein, calcium, iron, carotene and riboflavin consumption. Rural females are worse sufferers of protein, energy, mineral and vitamin deficiencies.

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INTRODUCTION

Food is defined as a substance, which yields energy for building up of new tissues and for repairing worn-out tissue as well as for the regulation of the body processes. Nutritional status refers to the health of an individual as it is determined by the intake of nutrients and their utilization (Bera, 2004). Malnutrition is a common problem in the rural areas. It is noted that dietary intake of women is poor than those of their adult male counterpart (Basu, 1993). Chronic malnutrition continues to exist extensively, especially among women of different age groups, because they are caught in the sequence of ignorance, poverty, inadequate nutritious food intake and diseases. Women, as an independent target group, account for 495.74 million and represent 48.3 percent of country's total population, as per the 2001 Census. The National Nutrition Policy (1993) advocates a comprehensive inter-sectoral strategy for alleviating all the multi-faceted problems of under/malnutrition and its related deficiencies and diseases. Inadequate dietary intake reflects the low intake of energy, protein and micronutrients (Vijayaraghavan and Rao, 1998). The two major problems of macro and micro-nutritional deficiencies noted in women community are reflected in chronic energy deficiency (CED) and vitamin A, iron and iodine deficiencies (NFHS-2, 1998). The National Family Health survey of 1998-99 shows that 51.8 per cent of women

(15-49 years) suffer from nutritional anemia, which can easily be prevented by providing better nutrition during their adolescent period and, more specifically, during pregnancy and lactation (NFHS-2, 1998). Recognizing the critical link between the health and nutritional status of women including mothers, the Xth 5 year Plan lays down special emphasis on these two nutritionally vulnerable groups. Poor nutrition among women begins in infancy and continues throughout their lifetime (Desai, 1994). They are also less likely to be able to provide food and adequate care for their children. Finally, a women health affects the household economic well being and a woman with poor health will be less productive in the labour force (Rao *et al.*, 2010). Adolescent account for 1/5 of the world's population, and in India they account for 22.8 per cent of the total population. Adolescent growth and development closely linked to the diet they received during their childhood and adolescence. Adolescents may represent a window of opportunity to prepare nutritionally for a healthy adult life. It may also be a timely period to shape and consolidate healthy eating and life style behaviors, thereby preventing the onset of nutrition related chronic diseases in adulthood. Number of adolescent in India particularly girls live under suboptimal conditions marked by poor nutritional status and high level of morbidity and mortality. Rural females of Darjeeling district of North Bengal belongs to very poor family. They are suffering more from the nutrition deficiency disorders. A large section of the females of the tea garden area are in a very serious condition of health. But we do not have the

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information about the diet, dietary habit, nutrient consumption, energy deficiency level of those females. Under this backdrop the present study is very much significant for the calculation of nutrient and energy deficiency and preparation of significant recommendations.

MATERIALS AND METHODS

Selection of subjects

The study was made in the two rural regions of the Phansidewa block of Darjeeling district. The Palanugachh and Ghughujhora villages of Bidhannagar-1 Gram Panchayet(GP) and the Kalugjoth, Khaliajoth, Nirmaljoth, Laldarjoth of Gossipukur GP were randomly selected for the collection of data. Two hundred families from Bidhannagar -1 GP and 200 families from Gossipukur GP were taken into consideration for diet survey. A total of 903 females out of which 266 adolescent girl and 637 women between 18 to 49 years of age were selected from the two GP of Darjeeling district. Women were again categorized into pregnant, lactating (152) group and non-pregnant as well as non-lactating (485) group. Both of these groups were moderate group of workers.

General Information

Informations like age, education, family size, occupation, family income, fertility rate were taken from the head of the family. All the heads of the families were informed about the type and purpose of survey work.

Dietary History

Informations related to dietary habits were collected by questionnaire cum interview method. Dietary habits covering the questions regarding nature of diet consumed, number of meals taken and amount of meal. Dietary intake was adjudged by 24 hr. recall method for seven consecutive days using standardized containers. Generally, the females of the sample villages take their food three times a day. The breakfast of the sample women is the rice and potato of the previous day, to save the preparation time. They go for work after taking breakfast at 9AM and this is mostly common in the families. The main items for lunch are boiled rice (Bhat) and pulse, vegetables or fish/meat. Subjects take launch at 4 PM after returning from work. At dinner, they again take rice or chapatti and vegetable. Chapattis are generally made of wheat flour. The milk products consumption depends on availability. Fruits consumption is also seasonal and occasional. The different food items consumed were converted into their raw equivalents, categorized into their respective food groups and average daily intake of energy, protein, carbohydrate, fat, beta carotene, thiamine, riboflavin, niacin, ascorbic acid and minerals (iron, calcium) were calculated from the values per 100g of edible portion.

Anthropometric measurements

Anthropometry is a powerful tool for the assessment of nutritional status, particularly in the field conditions where it is difficult to conduct clinical and laboratory tests (Johnston, 1981). Nutritional status of females was assessed using Body Mass Index (BMI). This is a good index to assess the current

forms of malnutrition in a community (Raman *et al.*, 1989). Stature and weight are the two basic measurements used for assessing nutritional status. Height and weight were measured respectively by Standard anthropometric rod (Lohman, 1988) and standard weighing machine. Body mass index (BMI) was calculated from the height and weight using following equation-

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2}$$

The chronic energy deficiency of females was calculated using James Classification (James *et al.*, 1988).

RESULTS

Information regarding education showed that the illiterate females were 40.53% (366). The education level of 33.44% (302) females was primary, 24.7% (223) females were intermediate and only 1.33% (12) females were graduate. The main source of income of the families were daily labour in the tea garden and agriculture. They were involved in all the family work like rearing of children and old aged members, clearing utensils, washing clothes, drying vegetables and grains, grinding and husking of food grains, cooking, bringing water. The average family size was 6.2 and the average family income was Rs. 3400 per month. We found that the average fertility rate of the area (3.6) was quiet high. Study showed that the adolescents consumed more amount of pulses, other vegetables and fruits than the other two groups. Pregnant and lactating mother consumed more amounts of cereals, roots and tubers, meat and fish, milk, oil and fat and sugar. Non – pregnant cum non-lactating mothers consumed more amounts of green leafy vegetables. We found that all the three groups consumed much less amount of nutrients than the recommended value. The energy deficiency in adolescent was 409 (19.85%) kcal, in pregnant and lactating group were 195 (8.94%) kcal and in non-pregnant and non-lactating group were 509 (22.84%) kcal. The percentages of protein deficiency in adolescents were 38.31%, in Pregnant and Lactating group were 17.47% and in Non-pregnant and Non-lactating group were 25.12%. There were very serious levels of deficits in minerals and vitamins consumption. Females are distributed into 70-50% and below 50% of RDA to find out a more clear idea of nutritional intake. Considering the energy consumption we found that a total of 27.44% adolescents remain in two categories. Similarly in case of protein, calcium, iron, carotene and riboflavin, the adolescents are 56.76%, 78.94%, 53.75%, 94.35% and 84.58% respectively. The total percentages of pregnant and lactating group and non pregnant cum non lactating group remain in two category are also high. In case of energy, protein, calcium, iron, carotene and riboflavin intake, the pregnant and lactating women are 9.76% 23.02%, 43.31%, 31.57%, 66.44%, and 79.60% respectively. The percentages of non pregnant cum non lactating group for energy, protein, calcium, iron, carotene and riboflavin are 35.66%, 38.14%, 32.97%, 35.05% 79.37% and 95.86% respectively. Study showed that the percent adequacy of calcium and riboflavin was below 50% both in adolescent and pregnant lactating group. The riboflavin adequacy was below 40% in non-pregnant and non-lactating group. The carotene adequacy for adolescent was 44.97%. Percent adequacy for Vitamins like thiamine, niacin, and vit-C were also lower.

Table 1. Average consumption of food stuffs (g/day) among females

Foodstuff	Adolescent		Pregnant and Lactating		Non-pregnant and Non-lactating	
	Average	SD	Average	SD	Average	SD
Cereals	292	44.12	386	67.81	356.88	61.37
Pulses	37.86	18.1	25.06	9.98	21.72	10.47
Green leafy veg.	16.33	10.25	39.28	16.71	45.34	17.59
Other veg.	68.93	33.94	51.08	21.74	50.7	19.76
Roots and tubers	63.1	27.05	66.84	24.25	51.74	21.88
Fruits	19.16	16.66	15.4	13.1	10.18	7.98
Meat and Fish	23.83	15.4	36.32	24.55	23.46	19.01
Milk	33.33	27.27	47.78	42.5	37.08	31.34
Oil and Fat	17.33	6.79	25.08	10.18	20.52	7.83
Sugar	13.83	11.87	23.50	8.76	12.34	6.55

Table 2: Average consumption of nutrients among females

Nutrient	Adolescent			Pregnant and Lactating			Non-pregnant and Non-lactating		
	Consumed	RDA	% of deficiencies	Consumed	RDA	% of deficiencies	Consumed	RDA	% of deficiencies
Energy(k cal)	1651.04	2060	19.85	1980.46	2175	8.94	1716.59	2225	22.84
Carbohydrate(g)	328.67	400	17.84	378.25	430	12.03	337.97	430	21.40
Protein(g)	40.1	65	38.31	53.64	65	17.47	37.44	50	25.12
Fat(g)	19.55	22	11.14	28.1	30	6.33	23.88	20	
Calcium(g)	299.86	600	50.02	417.89	1000	58.21	321.38	400	19.65
Iron(mg)	19.2	28	31.42	23.4	38	38.42	23.29	30	22.36
β-carotene(μg)	1079.48	2400	55.02	1447.18	2400	39.70	1326.63	2400	44.72
Thiamine(mg)	.718	1.0	28.2	0.71	1.1	35.45	0.72	1.1	34.54
Riboflavin(mg)	0.543	1.2	54.75	.522	1.3	59.84	0.51	1.3	60.69
Niacin (mg)	9.61	14	31.35	10.27	16	35.81	9.68	14	30.85
Vit-C(mg)	29.32	40	26.7	29.64	40	25.9	29.4	40	26.5

Table 3: Number and Percentage distribution of females according to intake of nutrients into 70-50% and less than 50% of RDA

Nutrient	Adolescent (%)		Pregnant and Lactating (%)		Non-pregnant and Non-lactating (%)	
	70-50%	<50%	70- 50%	<50%	70- 50%	<50%
Energy	56 (21.05)	17(6.39)	12(7.89)	03(1.97)	128(26.39)	45(9.27)
Carbohydrate	48 (18.08)	21(7.89)	23(15.13)	00(00)	137(28.24)	29(5.97)
Protein	115(43.23)	36(13.53)	23(15.13)	12(7.89)	125(25.77)	60(12.37)
Fat	29 (10.9)	09(3.38)	14(9.21)	05(3.28)	40(8.24)	06(1.23)
Calcium	112(42.1)	98(36.84)	42(27.63)	24(15.78)	106(21.85)	52(11.12)
Iron	97(36.46)	46(17.29)	30(19.73)	18(11.84)	115(23.71)	55(11.34)
β-carotene	93(34.96)	158(59.39)	70(46.05)	31(20.39)	197(40.61)	188(38.76)
Thiamine	18(6.76)	00(00)	08(5.26)	00(00)	43(8.86)	11(2.26)
Riboflavin	103(38.72)	122(45.86)	52(34.21)	69(45.39)	221(45.56)	244(50.3)
Niacin	15(5.63)	00(00)	12(7.89)	00(00)	55(11.34)	00(00)
Vit-C	09(3.38)	00(00)	06(3.94)	02(1.31)	36(7.01)	00(00)

Table 4: Percent adequacy (intake/RDAx100) in nutrient intake

Nutrients	Adolescents	Pregnant and Lactating	Non-pregnant and Non-lactating
Energy	80.14	91.05	77.15
Carbohydrate	82.16	87.96	78.59
Protein	61.69	82.52	74.88
Fat	88.86	93.66	119.4
Calcium	49.97	41.78	80.34
Iron	68.57	61.57	77.63
β-carotene	44.97	60.29	55.27
Thiamine	71.8	64.54	65.45
Riboflavin	45	40.15	39.3
Niacin	68.64	64.18	69.14
Vit-C	73.3	74.1	73.5

Table 5: Prevalence percent of chronic energy deficiency

BMI grade	Adolescent (266)	Pregnant& Lactating(152)	Non-pregnant& non-Lactating(485)
Grade III (<16)	(16)6.02	(08)5.26	(51)10.52
Grade II (16-17)	(27)10.15	(14)9.21	(56)11.55
Grade I (17.1-18.5)	(49)18.42	(22)14.47	(98)20.2
Low normal(18.6-20)	(91)34.21	(46)30.26	(138)28.45
Normal (20.1-25)	(76)28.57	(50)32.90	(120)24.74
Overweight (>25)	(07)2.63	(12)7.90	(22)4.54

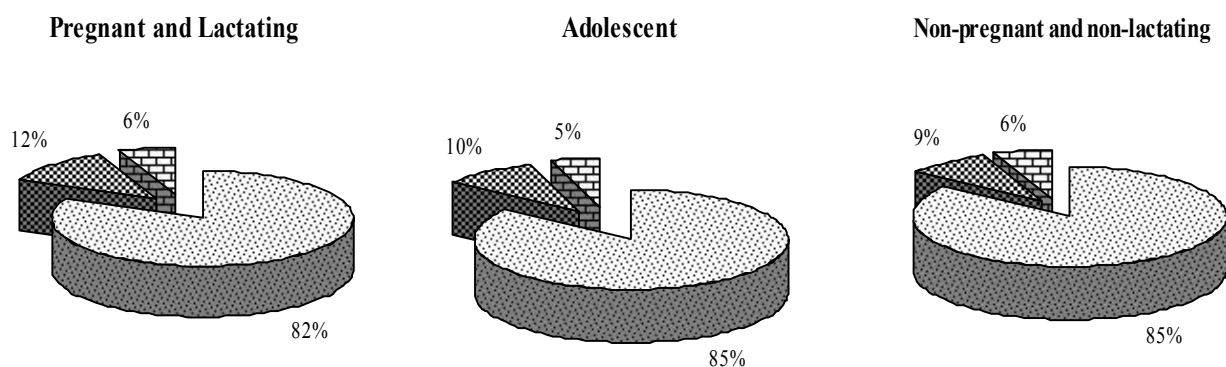


Fig 1: Contribution (%) of carbohydrates, fat and protein to total energy intake of rural females

The figure showed that the contribution of carbohydrate for energy was much higher -85%, 82% and 85% in respectively adolescent, pregnant lactating group and non-pregnant and non-lactating group. The contribution of protein and fat were much lower. The contribution of protein was 5%, 6% and 6% respectively for three groups and that was very much less contribution. The chronic energy deficiency table showed that almost 35% adolescent, 29% pregnant lactating group and 42% non-pregnant and non-lactating group were suffering from malnutrition. Higher percentage was belonging to grade-1 malnutrition in all the three groups. The percentage of overweight is very less and it was highest in pregnant lactating group.

DISCUSSION

According to 2001 census only 54.3% of Indian women were literate and 59.61% women of West Bengal were literate. Our study shows that the literacy levels of rural female are 59.47% which is quiet similar to the literacy rate of West Bengal. The high fertility of Indian women is one of the most detrimental socio-cultural influences on nutritional status (Rao *et al.*, 2010). Our study also shows the high fertility rate and that may be one of the causes of poor health status of women. Report indicated that malnutrition is a serious health concerns that Indian women face (Chatterjee, 1990). Our study reveals that the females are consuming much less amount of diet and that are seriously affecting their overall nutrition. Study on Oraon tribal of Jalpaiguri district showed that the intakes of all groups of oraon people were deficient in all food groups to a similar extent (Mittal and Srivastava, 2006). Regular intake of low amount of nutrient was causing the development of diseases as well as affecting labour work. Study showed that the intake of protective food such as milk, green leafy vegetables and fruit was very deficient among tribal women (Tamarasi and Ananthalakshmi, 1981). Our study also showed that females are consuming very less amount of protective foods. Deficit of fruit and vegetables lead to deficiency of several nutrients such as calcium, iron, riboflavin, vit-A, vit-C etc. (Mittal and Srivastava, 2006). The entire three groups are suffering from the deficiency of two significant mineral-calcium and iron and vitamins. This study focuses that the intake of diet is much lower than the recommended level. Similar study showed that the dietary intake of rural pregnant women is lower than the recommended level (Jood *et al.*, 2002). The intake of almost

all kind of nutrient by the subjects is less than the recommended dietary allowances. The energy deficiency level (<70%) was 27.44% in adolescent, 9.76% in pregnant and lactating group and 35.66% in non-pregnant and non-lactating group which is affecting the growth and development in adolescent. Our study showed a high level of pulse deficit. Pulse deficit indicates a deficit of protein rich (Kupputhurai and Mallika, 1993). Protein deficiency is causing the development of protein energy malnutrition and the deficiency is highest among the adolescent (57%). So the rural tea garden females of Darjeeling district are mostly suffering from the deficiency of energy, protein, iron and calcium, carotene and riboflavin. In comparison with the recommendations (ICMR, 2000), the contribution of carbohydrates to the total energy intake is observed to be on the much higher (82-85%) than the range (55-70%) in all groups. Contribution of protein is less (5-6%) than the recommendation (10-15%) and contribution of fat to the total energy is also much lower (9-12%) than the recommendation (20-30%). The chronic energy deficiency table suggested that non-pregnant and non-lactating group is suffering more (42%) than the other two groups. A high (35%) percent of adolescent and 29% pregnant and lactating group are suffering from chronic energy deficiency. So the macro and micronutrient level and health status of the entire three groups are very poor in the study zone.

CONCLUSION

Study shows that the dietary intake of the females in tea garden areas of North Bengal is very poor. All three groups are consumed much less amount of nutrients particularly protein, energy, calcium, iron and vitamins. 34.59% adolescent, 28.94% pregnant and lactating women and 42.27% non pregnant and non-lactating women are suffering from chronic energy deficiency. Social, educational and economical features are responsible for such results. Steps may be adopted at government and non government levels to raise dietary intake at this zone and to develop sound health for future generation.

RECOMMENDATIONS

1. Serious and effective steps must be taken to increase the income of the families.
2. Modifications in food habits like different vegetables in the different time of a day.

3. Supplementary feeding programme.
4. Educating the rural women regarding the nutritional requirement for the particular stage of life, e.g., menstrual, pregnant and lactating.
5. Immediate Implementation of compulsory schooling of girls at least up to high school level.
6. Ensuring the govt. level health and immunization programme.

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