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Diet and Physical Activity of Pregnant Women Working In Coffee Plantation, Coorg, South India.

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ABSTRACT

Nutritional status during pregnancy is determined by the macro and micro nutrient intake and dietary planning. To assess the dietary intake of antenatal mothers working in coffee plantations in South India and compare the same with their recommended dietary allowances (RDA) and physical activity. This was a cross sectional study done on 51 pregnant women attending a health facility in Ammathi, Coorg. Data collected included 24 hour dietary recall, physical activity, socioeconomic status and anthropometry. Dietary intake assessment software was used to calculate the macro and micro nutrient intake. Fifty one (85.0%) pregnant women were working in plantations and were doing moderate work.The mean calorie intake was 80.4% of RDA. Forty one (80.4%) and 25 (49%) of the women had inadequate intake of calories and proteins respectively. There was inadequate intake of the following nutrients: iron 51 (100%), folic acid 47 (92.1%), iodine 29 (56.8%), calcium 33 (64.7%). Significant association existed between type of activity and iron intake (t test, t=3.003, p=<0.05). Majority of the pregnant women who were working in the plantations had inadequate intake of calories, proteins, iron and folic acid.

INTRODUCTION

Pregnancy is recognized to be a vulnerable period for the mother and crucial for the health of the unborn child throughout the world. Pregnancy is a period of increased metabolic demands mainly due to changes in the woman's physiology and the requirements of the growing fetus [1].

A woman's normal nutritional requirement increases during pregnancy in order to meet the needs of the growing fetus and of maternal tissues associated with pregnancy. Proper dietary balance is necessary to ensure sufficient energy intake for adequate growth of fetus without drawing on mother's own tissues to maintain her pregnancy [1].

Nutritional status during pregnancy is determined by the nutrient intake and dietary planning during pregnancy, including the macro and micro nutrients. Good nutritional status during pregnancy is one of the best predictors of optimal pregnancy outcome. The consequences of poor nutritional status and inadequate nutritional intake for women during pregnancy not only directly affects women's health status, but may also have a negative impact on birth weight and early development [2].

The groups most vulnerable to micronutrient deficiencies are pregnant women, lactating women and young children, mainly because they have a relatively greater need for vitamins and minerals and are more susceptible to the harmful consequences of deficiencies. For a pregnant woman these include a greater risk of dying during childbirth, or of giving birth to an underweight or mentally-impaired baby [3].

During pregnancy and lactation, micronutrient adequacy for certain micronutrients such as iron can have substantial influence on pregnancy outcome, such as pregnancy mortality [4]. Inadequate intake of iron in pregnancy

can lead to maternal anemia and increased risks of maternal mortality if the anemia is severe [5]. Iron deficiency is also associated with increased risks of low birth weight and preterm delivery [6]. Low periconceptional folate intake increases the risks of neural tube defects [7].

Plantation workers engage in manual work throughout their pregnancy and their energy requirements could be expected to be higher than those of the other pregnant women. The FAO/WHO/UNU consultation on energy and protein requirements and the activity pattern have suggested that the energy increment provided by the food supplement is insufficient to meet the additional demands of pregnancy and the high energy cost of pregnant women's occupational activities [8].

This study is therefore done to assess the macronutrient and micronutrient deficiencies in pregnant women working in plantations based on their dietary intake.

Objectives

- To assess the dietary intake of antenatal mothers working in coffee plantations and attending a Healthcare facility in South India
- To compare the same with their recommended dietary allowances (RDA) and physical activity.

MATERIALS AND METHODS

This is a cross sectional study done on 60 pregnant women attending a health facility in Ammathi, South Coorg, Karnataka, South India during August 2011 to October 2011. Dietary intake was assessed using 24 hour dietary recall method, physical activity was assessed using international physical activity questionnaire (IPAQ) [9] socioeconomic status using standard of living index scale by Parashuraman et al. Anthropometric measurements which include height and weight were measured using standard calibrated instruments. Dietary intake assessment software [10] in which details of each individual's dietary intake based on 24 hour dietary recall was entered along with their height and weight, following which the software gave the expected nutrients intake for that particular individual in terms of macronutrient and micronutrients was used for this study. The data was entered in Microsoft Excel and analyzed using standard statistical package. Frequencies, measures of central tendency and deviation are used to describe the findings. Further, associations between demographic variables and nutrient intake are derived using chi squares, ANOVA and Pearson's correlation.

RESULTS

Table 1: Demographic and clinical profile of participants

Variable	Frequency (N=51)	Percentage
Age (mean yrs.)	23.82 ± 3.87 yrs.	
Age groups (in years)		
<19	5	9.8
20-29	41	80.4
>30	5	9.8
Education		
Illiterate	1	2.0
Primary (</= 4)	1	2.0
Middle (5-7std)	5	9.8
Secondary (8-10std)	17	9.8
PUC (11-12std)	14	33.3
Graduate	13	25.5
Socioeconomic status		
Low	38	74.5
Middle	13	25.5
Clinical Profile		
Parity index		
Primigravidae	29	56.9
Others	22	43.1
Trimesters		
First	7	13.7
Second	16	31.4
Third	28	54.9

Table 1 represents the sociodemographic and clinical profile of the respondents. A total of 60 pregnant women were interviewed, 51 (85.0%) of the women were working in plantations and were doing moderate work. The further analysis is for these 51 women working in plantations and among these workers, 41 (80.4%) were aged

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20-29 years with a mean age of 23.82±3.87 years, 17 (33.3%) were educated till secondary level and 38 (74.5%) belonged to lower socioeconomic status. (56.9%) were primigravidae, 28 (54.9%) were in third trimester, 41 (80.4%) received iron and folic acid supplements and 37 (72.5%) took calcium supplements.

Table 2 represents the per – capita income and expenditure on Food. The mean per capita income was Rs. 2156 and food expenditure was Rs. 823. There is a positive correlation between per-capita income and expenditure on food i.e. as the per-capita income increases expenditure on food also increases.

Table 2: Income and food expenditure

Measure/Capita	Mean	Median	S.D	Min	Max
Income (Rs)	2156	1666	2037.8	300	11250
Food Expenditure (Rs)	823	750	474.0	100	2500

N= 51, r=0.71, p<0.01

Table 3 represents the Macronutrients intake by the pregnant women and RDA. The mean energy intake was 80.69% of RDA whereas the mean fat and protein intake was in excess of RDA. However 41 (80.4%) and 25 (49%) women had inadequate intake of calories and proteins respectively.

Table 3: Average macronutrient intake by pregnant women in comparison with RDA

Nutrients	Mean ± S.D	RDA	% of total requirement	% of inadequate intake of macronutrients (n)
Energy (kcal)	2370.80 ± 544.51	2937.60	80.69	80.4(41)
Protein (g)	76.34 ± 23.68	72.92	104.10	49 (25)
Fat (g)	77.91±25.60	30	259.67	1.9(1)

Table 4 represents the Micronutrients intake of the pregnant women and RDA. All, 51 (100%) of the pregnant women had had inadequate intake of iron. A large proportion of the women had inadequate intake of fibre 50 (98%), folic acid 47 (92.12%), vitamins B6 38 (74.4%), iodine 29 (56.8%), calcium 33 (64.7%) and vitamin A 13 (25.48%).

Table 4: Average micronutrient intake by pregnant women in comparison with RDA

Nutrients	Mean ± S.D	RDA	% of total requirement	% of inadequate intake of micronutrients (n)
Calcium (mg)	730.32 ± 451.96	1000	73.03	64.7(33)
Iron (mg)	16.30 ± 4.61	38	42.02	100(51)
Folate (mcg)	267.3 ± 91.7	400	66.70	92.12(47)
Vitamin A (mcg)	8032.5 ± 5203.5	3000	267.7	25.48(13)
Thiamine (mg)	1.33 ± 0.46	1.30	102.30	52.9(27)
Riboflavin (mg)	1.41 ± 0.51	1.50	94.0	58.8(30)
Niacin (mg)	20.02 ± 7.70	16.04	125.0	35.28(18)
Vitamin B6 (mg)	2.09 ± 0.67	2.50	83.6	74.48(38)
Vitamin B 12 (mcg)	4.43 ± 4.07	1.0	443.0	17.64(9)
Vitamin C (mg)	131.03 ± 121.24	40	327.5	9.8(5)
Fibre (g)	10.73 ± 3.43	20	53.5	98(50)
Iodine (mcg)	134.50 ± 67.30	150	89.66	56.8(29)

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Table 5 represents macro and micronutrient intake and trimester of pregnancy. There is no significant difference between the mean intakes of energy, protein, iron and trimester of pregnancy (ANOVA test, $p>0.05$). However there is a significant difference between the mean calcium intake and period of pregnancy (ANOVA test, $F=18.92$, $p<0.01$). After the post-hoc test, there is a significant difference between the mean calcium intake in first and second trimester ($p<0.01$), between first and third trimester ($p<0.01$) and there is no significant difference between the second and third trimester ($p>0.05$).

Table 5: Period of Pregnancy and macro and micronutrients

Nutrient	Trimester	N	Mean	SD	F value	p-value
Energy (kcal)	1	7	2567.4	729.2	0.725	0.48
	2	16	2409.0	524.6		
	3	28	2299.8	511.7		
	Total	51	2310.8	544.5		
Protein (mg)	1	7	70.42	21.93	0.328	0.72
	2	16	75.36	22.84		
	3	28	78.39	25.06		
	Total	51	76.34	23.68		
Iron (mg)	1	7	16.66	4.9	2.16	0.12
	2	16	18.17	4.28		
	3	28	15.24	4.53		
	Total	51	16.35	4.61		
Calcium(mg)	1	7	941.4	380.5	18.92	<0.01
	2	16	750.1	447.1		
	3	28	890.1	315.4		
	Total	51	730.3	451.9		

DISCUSSION

Plantation is a part of agriculture and it directly employs more than 2 million workers in the country. The concentration of tea, coffee, rubber, and spice plantations is greatest in South India [11]. Women workers have all along been a major part of the labour force engaged in the plantation industry in India.

Plantations have their own health delivery system based on the guidance of the plantation labour act, mainly due to geographic difficulties. The health and welfare of the plantation workers are generally the responsibility of its management. The plantations are closed settings, with good contact between health care teams and the population which may result in early identification and better management of health related ailments and aids as a help to the existing government's primary health-care system.

Physical activity and dietary intake

There is a progressive increase in women's participation in labor force partly due to economic reasons. The economic returns are sometimes essential for improving the dietary intake of the family but dual burden of work at home and at the work place has resulted in some deterioration in maternal nutrition status [12].
A combination of reduction in dietary intake to below habitual levels and simultaneous increase in physical activity causes a "breakdown" of adaptive processes and results in deterioration of the maternal nutritional status and

poor intrauterine growth of the fetus. In agricultural communities like plantation workers when dietary intakes are lowest and physical activity is highest, pregnancy weight gain is very poor, the mean birth weights are lower and prematurity rates are higher [13].

Macronutrient intake

Studies done among rural pregnant women found the mean energy intake in the range of 61%-75% of RDA [14-19]. The calorie and protein intake was less in our study when compared to a study done in a rural area of Lucknow where 118 (29.5%) and 98 (24.5%) had inadequate intake of calories and proteins respectively [20].

Micronutrient intake

Low dietary intake is the primary cause of micronutrient deficiencies at a public health level, but genetic factors, nutrient interactions, poor absorption, drugs, and diseases such as diabetes and hypertension may contribute, especially at an individual level. Iron, foliate, vitamin D, and zinc are of greatest concern due to high losses and requirements; these can be linked to an inadequate consumption of fruits, vegetables, meat, and animal sources of food [4].

Studies done among rural pregnant women found the mean iron intake in the range of 40%-76% of RDA [15,16,18] as compared to our study which was 42%. In a study done in a rural area of Lucknow 144 (36%) had inadequate intake of iron as compared to our study where 51 (100%) of the pregnant women had inadequate intake of iron probably because of not including enough green leafy vegetables in the diet [20].

The National nutrition monitoring bureau (NNMB) survey revealed that intake of dietary iron is grossly inadequate in most of the states, meeting less than 50% of RDA and the prevalence of anaemia in pregnant women was found to be 74.6% [14]. In a study of anemia in pregnancy conducted in the plantation sector it was found that 58.3% of the subjects were anemic mainly due to iron deficiency [21,22].

Iron deficiency anemia is known to reduce physical capacity and work performance [23-25]. The potential impact of anemia on working women in the plantation sector is high since the take home pay is linked to the weight of tea leaves plucked. In our study Significant association existed between moderate physical activity and iron intake (t test, t=3.003, p=<0.05).

Our study found that the calcium intake is 72% of the RDA similar to other study done in Orissa where it was found to be 80% [18]. In developing countries where milk intake is low, most dietary calcium comes from cereals. Since these are only a moderate source, the daily intake of Calcium in such communities is in a low range of 300-600 mg a day. Other rich sources of Calcium among plant foods are the millet ragi and the green leafy vegetables [26].

Our study found that the foliate intake is 66.7% of the RDA compared to other studies where it was found to range from 12.9%-41% [14-16,18]. This might be due to the inclusion of inadequate amounts of green leafy vegetables and dairy foods.

In our study we found that riboflavin intake is 94% of the RDA, as compared to other studies which range from 54%-80% of RDA [14,15,18,19]. Thirty (58.8%) and 27 (52.9%) of the pregnant women had inadequate intake of riboflavin and thiamine respectively. This might be due to the occasional inclusion of animal protein like egg, mutton, chicken, etc., in their diet.

Studies from NNMB have found that 29% of household consumed thiamine less than 60% of RDA [14]. Inadequate intake is the major cause of thiamine deficiency in developing countries. Rich sources of thiamine include whole grain cereals, nuts, legumes, green leafy vegetables, organ meats, pork, liver and eggs, etc. On an average, about 40-50% of the vitamin present in raw foods is lost during processing and cooking as practiced in Indian homes.

Dietary deficiency of riboflavin is rampant in India. Recent NNMB surveys show that only about 13% households meet the dietary requirement of riboflavin and more than 60% get less than 60% [27]. Rich dietary sources of riboflavin are flesh foods, poultry, dairy products, legumes, nuts and green leafy vegetables, Cooking losses of riboflavin in Indian preparations is about 20% [26].

In this study, the intake of iodine was 89.6% of RDA. Iodine deficiency in hilly areas is well documented, the foods that are grown in such soils are deficient in iodine, and communities solely subsisting on such foods get exposed to iodine deficiency. Goiter, hypothyroidism, and cretinism are well-recognized consequences of severe

iodine inadequacy; however, less recognized is the effect of milder levels of iodine inadequacy on poor reproductive outcomes such as stillbirths and birth defects [28].

Dietary intake and period of pregnancy

In our study there is no significant difference between the mean intakes of energy, protein, iron and period of pregnancy (ANOVA test, $p>0.05$). However there is a significant difference between the mean calcium intake between the three trimesters. In a study done in Orissa correlation indicates that the difference in the mean values of intake of energy, protein and calcium by the pregnant women in different trimesters was found to be insignificant ($p < 0.05$) and iron intake was found to be significant ($p > 0.05$) [18].

Recommendations

The crèches attendants can utilize the crèche to provide the expectant mothers supervised iron and folic acid tablets, nutritional supplementation and also act as place to rest in the afternoon. Regular health sessions to the pregnant women regarding balanced dietary intake and improved cooking practices should be initiated. Promoting kitchen gardens, where growing of nutritionally rich vegetables and fruits can be encouraged.

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