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Research Paper

Impact of family's vegetable cultivation on the nutritional status of rural Garo women

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ABSTRACT : The objective of this study was to do a comparative analysis of the nutritional status of the farming and non-farming communities. In order to meet the objective, fifty one farmers and fifty one non-farmers/ non-vegetable growers were randomly selected from three villages from the West Garo Hills district. A questionnaire was prepared to ascertain their food consumption pattern, dietary intake and farming practices. After statistically analyzing the data, it was revealed that there was no significant difference in the food and nutrient consumption, anthropometric status (height and weight) of women belonging to farming and a non-farming family. The communities need to be educated in the importance of consuming adequate amounts of vegetables, especially green leafy vegetables. The only way to combat the high incidence of anaemia in the population is to increase the iron intake, which was found to be way below the RDA. The farmers can also be encouraged to increase their production of vegetables, so that it not only increases the family income but also increases their intake.

KEY WORDS : Nutritional status, Vegetable cultivation, Rural women

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Health and nutrition are the most important contributory factors for human resource development in the country. Good nutrition is the fundamental basic requirement for maintenance of positive health. A proper diet is essential for growth, development and active life (Amirthaveni and Barikor, 2002).

Women's health status varies widely both within and among countries because of such factors as local disease prevalence, health-related behaviours, educational status, and exposure to health information, influence on decision making and access to health care. Poverty, environmental degradation, civil conflict and migration also influence women's health (Majumdar, 2006). Women in general and pregnant women in particular have special nutritional needs. They need three times more iron than men to replace iron lost during menstrual bleeding. Pregnant and breastfeeding women need 20 times more. It has been observed that many girls enter motherhood without adequate preparation for it. This results in high wastage of human resources and an increase in maternal mortality rate.

Dietary surveys have shown that the dietary intake of women in low income groups is deficit by 500-600 calories. Over 50 per cent of pregnant women have haemoglobin level of less than 10 grams. A significant fall in birth weight has been observed with decrease in haemoglobin levels (Kumar *et al.,* 2006).

Vegetables supply many nutrients besides providing variety to the diet. Though Indian population is mostly vegetarian, the intake of vegetables has been low in daily diet. People do not eat vegetables or eat less in quantity because they are expensive, need more preparation time, or due to ignorance of their importance (Srilakshmi, 2000).

The vegetation of Garo Hills can be broadly classified into the flora of tropical and sub tropical zones based on altitude. The tropical vegetation covers areas up to an elevation of 1000 mts (above mean sea level) and subtropical vegetation occurs at elevation above 1000 mts. Economy of Garo Hills is basically agrarian with agriculture playing a predominant role. About 81 per cent of the population depends on agriculture (Agriculture profile of Meghalaya,2002).

Since there is no systematic and scientific information about the vegetable cultivation and its impact on nutritional status of Garo women, this present investigation was undertaken to bring to light whether vegetable cultivation has an impact on nutritional status.

■ RESEARCH METHODS

Fifty one farmers and fifty one non-farmers were randomly selected from three villages of the West Garo hills district of Meghalaya. The villages were purposely selected for their accessibility. Survey method was adopted in order to collect data from selected respondents with the help of a pre-tested schedule. The selected respondents were personally interviewed. Anthropometric measurements (height and weight) were taken and haemoglobin level was tested to examine the incidence of anemia using Hemokwik Haemoglobin Scale.

■ RESEARCH FINDINGS AND DISCUSSION

Consumption of vegetables, especially green leafy vegetables, forms an essential part for healthy living. Majority of the rural Garos' depend on agriculture for their livelihood. This study has been designed to bring to light, the variations in nutritional status of women who come from farming and non-farming families. It will assess the impact of vegetable cultivation on the nutritional status of these women.

General profile :

In this study a total of 102 samples from three villages of the West Garo Hills district were selected. The respondents were all women. Half of the study population (51) belonged to a farming family, and the other half (51) to a non-farming family. Majority of the subjects were married (90.1 %) and had 5-7 members in the family (58.8%). Their education was upto High School (44.1%) and Primary (41.2%) levels.

The average income of the families per week was Rupees one thousand one hundred and twenty six, 22 paisa (Rs. 1,126.22/-). Out of the total income, Rs. 747.3/- per week was spent on purchasing various food items, from which Rs. 222.9/- was spent on vegetables. (Table 2).

The farmers spent 16.56% of their earning on buying vegetables, whereas, non-farmers spent 23.72 per cent. Thus, farming families spent lesser amount of their income in buying vegetables per week.

Anthropometric measurements :

The mean height of rural Garo women is 148.7 cm. Since the Garos are a race with Mongoloid build, they are shorter in stature than their taller Indian counterparts. On application of t-test it was revealed that there was no significant difference in the height and weight of the farming and non-farming populations (Table 3).

Quetelet's Index, the most widely used height-weight index, is commomly referred to as body mass index (BMI) and is a validated measurement of nutritional status. BMI measurement requires weight and height measurement. Based on the result, it can indicate overnutrition or undernutrition. BMI accounts for differences in body composition by defining

Table 1 : Personal profile of respondents

Sr. No.	Variable	Particulars	Frequency	Percentage
1.	Marital status	Married	92	90.1
		Unmarried	10	9.8
2.	Family	Upto 4	7	6.8
		5-7 members	60	58.8
		8 members and above	25	24.5
3.	Literacy	Illiterate	9	8.8
		Primary	42	41.2
		High School	45	44.1
		Higher Secondary	6	5.9
4.	Occupation	Farmer	50	49
		Gram Sevika/farmer	1	.98
		House wife	38	37.2
		Labour	5	4.9
		Student	4	3.9
		Vendor	4	3.9

Table 2 : Expenditure pattern of farmers and non-farmers

Per week basis	Total study population	Farmers	Non-famers
Total income (in Rupees)	1, 126.22 ±711.9	1,041.66 ±637.8	1, 210.78 ±776.16
Expenditure on food (including vegetables) (in Rupees)	747. 3 ±388.64	686. 27 ±366.7	808. 3 ±299.2
Expenditure on vegetables (in Rupees)	229. 9 ±105.3	172. 54 ±83.8	287. 25 ±93.05

the level of adiposity according to the relationship of weight to height, thus eliminating dependence on frame size (Mahan and Stump, 2000). The mean value of BMI was 21.5±2.67, indicating that the population under survey had a normal nutritional status based on BMI classification. On application of t test (P=0.05 and 3df), it was revealed that there was no significant difference in the BMI of the farming and non farming populations (Table 4).

Measurement of the concentration of haemoglobin in the whole blood is probably the most widely used screening test for iron-deficiency anaemia. A low haemoglobin concentration is associated with hypochromia, a characteristic feature of iron-deficiency anaemia (Gibson,1990). Haemoglobin of the study population was estimated using Haemoglobin Colour Scale. Table 5 reveals that majority of the farmers (74.5%) and non-farmers (70.5%) had low haemoglobin levels. Only 29.4 per cent of the non-farmers had haemoglobin level in the acceptable range. As far the farmers only 3.9 per cent had acceptable haemoglobin level. The high incidence of anaemia can be accounted for the fact that both farmers and non farmers consumed low levels of green leafy vegetables. A similar finding was reported by Kumar *et al*. (2006) in their study. On application of t-test it was revealed that there was no significant difference in the incidence of anaemia between the two populations.

Clinical assessment :

Clinical assessment of population was carried out (Table 6). Pale conjunctiva was found in 37.3 per cent of the population, with higher incidence among the farmers (41.2%) than non-farmers (33.3%). Majority of the study population had low levels of haemoglobin. The reason may be due to low intake of iron (34.8 % of the RDA) in their diet. Bleeding gums was also a common complaint among the subjects (26.5%). The consumption of beletnut (arecanut) is common among the Garos', which may have contributed to bleeding gums besides poor oral hygiene.

Table 3 : Mean values of height, weight and BMI of the subjects

Height (cm)			Weight (kg)			BMI	
Garos		Indian*	Garos		Indian*	Garos	
Farmers	Non-farmers		Farmers	Non-farmers		Farmers	Non-farmers
149.1	148.39	155	48.62	49.05	50	21.74	22.17

t = 0.553, t = 0.735 * ICMR, 1990

Table 4 : Nutritional status on the basis of BMI (Body mass index) classification (n=102)

BMI classification*	Farmers	Non-farmers
<18.5 (under weight)	6	3
18.6-24.9 (normal)	37	39
25-29 (over weight)	8	9
>30 (obese)	0	0
Total	51	51

(* Mahan and Stump, 2000) t= 0.5

Table 5: Classification of women into different levels of anaemia (% population)

	Level of anaemia		
	Deficient	Low	Acceptable
Farmers	21.5	74.5	3.9
Non-farmers	0	70.5	29.4

Note: Cut-off level of anaemia as per WHO classification t=0.499

	Deficient	Low	Acceptable
Adult women	<10	10.0-11.9	12 and above

Table 6 : Clinical assessment of the population (n=102)

	Farmers	Non-farmers
Pale conjunctiva	21	17
Magenta tongue	1	0
Bleeding/spongy gums	11	16
Thyroid enlargement	1	0
Koilonychia	1	0
Total	35	33

The incidence of cases of Magenta tongue, thyroid enlargement and Koilonychia was low (0.98% each).

Majority of the subjects (67.6%) consumed three meals a day. The day starts with a cup of tea in the early morning (5:30-6:00 am) followed be a proper meal (rice and a dish) around 8:00 am. The leftover food is consumed in the noon time. Dinner is usually eaten before dark. 100 per cent of the subjects cooked their food in open fires. Dried fish is popular item among the Garos'. Portioning of food was practiced in 6 per cent of the study population, out of which 83.3 per cent served one bowl to females and two bowls to male members of the family.

From Table 7, it was seen that the staple food of the Garos' was rice, with 100 per cent of the subjects confirming a daily intake of cereals. Pulses were consumed only occasionally (73.5%). The mean daily intake of pulses was only 11.8 ±19.9g. Only 29.4 per cent of the population consumed green leafy vegetables (GLV) daily. The consumption of GLV was only 38.8 ±44.6 g, which met only 31.4 per cent of the RDA. There was hardly any difference in the amount of GLV consumed between the two groups. 67.6 per cent of the population consumed other vegetables only 1-2 times per week and the amount consumed met 66.9 per cent of the RDA. Fruits consumption was however, found to be satisfactory, especially among the non-farmers (33.5g ±60.98). The intake of roots and tubers was high (95g ±95.86). It was found to be 26.6 per cent more than the RDA.

The intake of milk and milk products was found to be low (37.7g ±36.77). The only source of milk in their diet was through tea. 64.7 per cent of the population consumed meat and poultry only 1-2 times per week. However, the intake was found to be sufficient (30.68g ±51.94) and met the RDA. The Garos' are a non-vegetarian tribe. It is common practice among the Garos' to consume meat on sundays.

The cooking methods of the tribe are simple. Food is either simmered or boiled or occasionally fried. Traditional cooking methods include those cooked in bamboos (*Brenga*), or wrapped in banana leaf and covered with hot ash (*O'tepa*). Soda based dishes are a local delicacy with 45 per cent of the

Table 7 : Mean intake of food of the subjects (in g)

Food stuff (g)	Mean daily intake			RDA*
	All subjects	Farmers	Non-farmers	
Cereals	305.8 ±66.84	300.8 ±65.47	310.8 ±68.46	350
Pulses	11.8 ±19.9	6 ±15.63	17.1 ±22.38	55
Green leafy vegetables	38.8 ±44.6	41.3 ±45.46	36.3 ±44.15	125
Other vegetables	50.2 ±42.6	58.7 ±48.3	41.7 ±34.46	75
Fruits	26.5 ±54.26	19.5 ±46.13	33.5 ±60.98	30
Roots and tubers	95 ±95.86	95.3 ±101.9	94.8 ±90.39	75
Milk and milk pdts	37.7 ±36.77	28.9 ±32.54	46.5 ±38.92	100
Meat/fish/poultry	30.68 ±51.94	27.5 ±47.3	33.9 ±56.5	30
Oils/fats	15.3 ±12.18	15.2 ±13.07	15.4 ±11.35	40
Sugar	7.3 ±4.59	7.5 ±4.9	6.96 ±4.25	30

(* Swanimathan, 2004) t= 0.022

Table 8 : Mean nutrient intake of the study population

Nutrient	Study population	Farmers	Non-farmers	RDA*
Energy (Kcal)	2038 ±286.8	2026 ±292.9	2049 ±282.9	2225
Protein (g)	60.4 ±54.4	59.55 ±57.47	61.25 ±51.78	50
Carbohydrates (g)	407.64 ±61.39	411.32 ±51.96	403.95 ±69.9	-
Fats(g)	27.83 ±49.7	33.77 ±10.06	21.89 ±12.9	20
Iron (mg)	10.44 ±4.47	10.27 ±5.27	10.61 ±3.54	30
Vitamin C (mg)	80.27 ±70.28	82.92 ±67.6	77.61 ±73.43	40
Carotene (µg)	1086.1 ±2199	826.9 ±1523.7	1345.21 ±2704.4	2400

(* Gopalan *et al.*, 2007) t = 0.356

Table 9: Income from vegetable production

1.	Percentage of farmers whose production enough to meet household needs	98%
2.	Entire produce consumed/sold	Entirely consumed: 19.6% Sold: 80.4%
3.	Percentage sold from total production	44.3%
4.	Income from selling per week	Rs. 293/-

study population consuming it 4-6 times a week. The intake of oil was therefore, low (15.3g ±12.18). The sugar intake was also found to be only 7.3g ±4.59, the source being tea, which was consumed not more than twice a day, t-test (P=0.05 and 9 df) revealed that there was no significant difference in the intake of various kinds of food between the farming and non-farming communities.

Consumption of protective foods among women from farming families :

Protective foods are those foods that protect our body against disease causing agents. Consumption of dry fish and smoked meat/fish is popular among the Garos'. High consumption of smoked foods has been proven to cause various kinds of cancer. Soda based dishes is another popular item among the tribe. This destroys B vitamins. Therefore, consumption of protective foods is essential, as they are known to contain anti - cancerous properties. The foods which have protective role include those which are rich in antioxidants, proteins, vitamins and minerals. Coloured vegetables and fruits, whole grain cereals, pulses, meat, fish, poultry and oils are examples of protective foods. The protective foods grown and consumed by the farming communities included vegetables such as broccoli, cabbage, tomato, carrot, pumpkin, mustard leaves etc. However, as stated in Table 7, the intake was not enough to meet the RDA. The consumption of meat / poultry almost met the RDA. It can therefore be concluded that although protein intake was found to be satisfactory, the diet lacked daily sources of antioxidants, vitamins and minerals the sources of which are coloured fruits and vegetables.

Since the farming families cultivate protective foods, they need to be educated to increase their intake of these foods inorder to improve their heath status.

The energy, iron and carotene intake of the population did not meet the RDA (Table 8). Iron intake was especially low and met only 34.8 per cent of the RDA. This attributed to the high incidence of anaemia in the population. Since the intake of vegetables was low, the carotene intake also could not meet the RDA requirement. Protein and fat intake was found to be satisfactory. Vitamin C intake was found to be higher than the RDA. This can be attributed to the fact that fruit consumption was satisfactory among the Garos' and the common fruits found in the region are oranges, pineapple, lemon, amla, banana which are good sources of vitamin C. Besides, consumption of roots and tubers such as tapioca, sweet potato is also high (95g ±95.86), contributing to the intake of vitamin C.

On application of t-test, it was revealed that there was no significant difference in the intake of nutrients between the farming and non-farming communities. A similar finding was reported by Kumar *et al*. (2006) in their study, where the research finding showed that, food and nutrient consumption did not differ significantly in the categories of families whether they cultivated or did not cultivate leafy vegetables.

Farming related survey :

(Applicable only to the farming families)

Each of the farming family on an average owned about 1.12 acre of land. Out of this total land holding, 0.5 acre was cultivated. Farmers grew a wide variety of vegetables. Ninety eight per cent of the respondents confirmed that the vegetable production in their fields was enough to meet the household consumption. On the question of whether the cultivated vegetables were sold or entirely consumed, 19.6 per cent of the farmers responded that the entire produce was consumed where as 80.4 per cent of the farmers responded that 44.3 per cent of the total produce was sold in the local markets. The income from selling these vegetables was Rupees two hundred and ninety three per week.

Since the farmers depend on farming for their livelihood, majority of their vegetable production is sold for income generation. It has already been noted that the intake of vegetables was also low in the farming population, so the farmers need to be encouraged to increase their vegetable production and thereby increase their intake.

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