

Horticultural Nutrition Intervention through Women's Participation: An Action Research

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KEYWORDS Female.Knowledge.Nutrition Education.Nutritional Status

ABSTRACT India's food and nutrition problems continue to be formidable and malnutrition is still one of the crucial problems in the process of development. The magnitude of malnutrition and the ignorance about the relationship between food and health among a majority of the population at all levels necessitates the need for nutrition education. This approach in the long term may promote self-reliance and self-support in the communities. Nutrition intervention programmes have been taken up and are being implemented by the Central and State governments and voluntary agencies with a view to ameliorating the nutritional status and health of the vulnerable sections of the population. The present study is an attempt to study the impact of horticultural nutrition intervention through women's participation on nutritional knowledge of women and dietary intakes and nutritional status of their families. The study revealed that the horticultural nutrition intervention through women's participation has a positive impact on women.

INTRODUCTION

Maternal and child under nutrition contributes to more than one-third of children deaths and more than 10 percent of the total global disease burden. The number of global deaths and disability-adjusted life years (DALYs) in children less than 5 years old attributed to stunting, severe wasting and intra uterine growth restriction, constitutes the large percentage of any risk factor in this age group (Black et al. 2008). Therefore, reducing infant and young child growth retardation is essential to achieve the Millennium Developmental Goals (MDG) related to child survival (MDG-4) as well as the eradication of extreme poverty and hunger (MDG-1). Sound nutrition for mothers as well as children is central to health, learning, economic development and well-being. New developments and improvements in coverage of nutrition interventions are taking place, which are helping to drive results across the Millennium Development Goals (Veneman 2008).

Targeted nutrition interventions exist and that if implemented at scale during the window of opportunity (pregnancy and up to the child's second birth day), these interventions could reduce under nutrition-related mortality and disease burden by 25 percent in the short term (Bhuta et al. 2008). The set of interventions rec-

ommended addresses mainly the "FOOD" (and nutrient) intake needs of mothers and children because this is where most of the quantitative evidence of efficacy and effectiveness lies (Ruel 2008).

Nutrition education affords one of the greatest opportunities for the individual to control the quality of his health and well-being and remains the single greatest challenge to the professional worker in the field of nutrition.

It can settle for nothing less than the creation of awareness and interest, the seeking and acquisition of knowledge and the motivation to change and the adoption of new behaviour patterns. Deliberate and sustained nutrition education has been recognized as potent weapon for prevention and control of malnutrition, obviously the goal of these educational efforts ought to be beyond mere transfer of information.

Sustained health /Nutrition education and implementation of various prophylaxis programmes against nutrition related problems were two important strategies envisaged in the national policy adopted by Government of India. These twin approaches will help prevent control several nutrition related problems and promote healthy lifestyles.

The nutrition intervention programmes so far implemented in India include Supplementary Nutrition Programmes, Special Nutrition Progra-

mmes, Applied Nutrition Programmes, Mid-day Meals, Food subsidies for poor, Food for work programme, Nutrition Rehabilitation Centres. Many of these programmes discontinued for various reasons. Nutrition intervention aiming at consumption of nutritious food, especially micro nutrients should indicate the ways and means of accessing nutritious food.

Taking into account the vital role played by women in the family and their proportion in the population profile, it is impossible to think of development without educating women. Women in India continue to play crucial role in food selection, preparation and distribution.

Though the efforts are being made to improve the existing nutritional practices to achieve higher levels of nutritional status for various segments of Indian population, it could not achieve expected outcome due to poor access to nutritious food, diversity in food production and high prices of perishables viz., vegetables and fruits. Hence, the most rational and sustainable solution to the deficiencies of micro nutrients like vitamin A and iron is to enhance the availability and ensure consumption of foods rich in these micro-nutrients by the communities at risk. Horticulture production can be easily made accessible particularly to the poor through kitchen gardens and this calls for horticultural nutrition intervention and extensive nutrition education. Kitchen gardening continues to be the best way of improving the diets and nutritional status of population.

METHODOLOGY

The impact of Horticultural Nutrition Intervention through women's participation in the nutritional knowledge of women and nutritional status of their families is an action research designed using participatory methodology. The Indian Council of Agricultural Research (ICAR) sanctioned kitchen gardening programmes, implemented through the Krishi Vigyana Kendras (KVK) was made use of for the present study. As a part of the programme, the beneficiary families were given inputs such as seeds and samplings (for growing greens, brinjal, drumsticks etc. and papaya, guava, banana etc.) and initial working capital to develop kitchen gardens. The women beneficiaries of the programme were chosen as focus group. The reason for choosing the housewives as focus group

was they are the caretakers of their families. A horticultural, nutritional educational intervention programme was planned for these women beneficiaries for a period of six months.

Locale of the Study

The habitations covered under Acharya Ranga Krishi Vigyana Kendra, Tirupathi was chosen for the study. Nutrition intervention programmes of KVK constitute activities that are concerned to the families. The aspects dealt in such programmes help the members of the family for their development in all aspects which may in turn lead to the development of the community.

Among the intervention programmes of KVK, the Horticultural Nutrition Intervention was chosen particularly as it aims at improved production, availability and utilization of perishables in order to promote better nutritional status. Widespread vitamin and mineral deficiencies in rural communities can be overcome by growing and consuming fruits and vegetables grown in kitchen gardens. Hence to study the impact of these nutrition gardens on family nutritional status, the horticultural nutrition intervention programme conducted by Acharya Ranga Krishi Vigyana Kendra was made use of for the present study.

Sample Selection

The nutrition wing of Acharya Ranga Krishi Vigyana Kendra, Tirupathi organized a kitchen gardening programme sanctioned by ICAR for scheduled caste families. All the ten scheduled caste families with the family sizes of five to ten were chosen for the study. Thus, the sample comprised of twenty women hailing from the ten families form the focus group of present study. The men and children from these families were also assessed in terms of nutritional status. Thus, the twenty women, men and children constitute the sample of the study. The study was conducted in three stages:

In the first stage, the general information about the family and the nutritional knowledge of the women was gathered using a questionnaire. Nutritional status of the families under study was assessed using anthropometric and clinical methods.

In the second stage, based on the nutritional knowledge and dietary information gathered, a nutrition education programme was planned and implemented to improve the intake of horticultural produce such as green leafy vegetables, roots and tubers and other vegetables which were hitherto not adequate in the diets of the families under the study.

In the third stage, utilization of horticultural produce was assessed with the help of diet survey and weighing method and also its effect on nutritional status of the families was assessed. The impact of Nutrition Education Programme was assessed by testing the final nutritional knowledge of the women.

Tools for the Study

A structured nutritional knowledge questionnaire (Sridevi 1989) was adopted. The questionnaire was modified to suit the need of the study which is in local language. The questionnaire was administered twice (before and after intervention programme),

1. in the first stage of the study to collect initial nutritional knowledge of women,

2. at the end of the intervention programme to collect final knowledge of the women.

Data on family members viz., weight, height, mid-upper arm circumference (MUAC), head and chest circumference, fat fold measurement were taken. For dietary survey, ICMR's 24 hour recall method was used. A set of vessels were standardized and a ready reckoner was prepared to aid in calculation of nutritive value of diets. The nutritive values of the diet consumed by each subject was calculated and the mean dietary intake of each nutrient was compared with their corresponding Recommended Dietary Allowances of I.C.M.R. (1993b). Dietary adequacy and deficit was determined before and after the nutrition education programme by dividing the reported levels of consumption by the recommended intake.

RESULTS AND DISCUSSION

The study being an action research on a small sample, the data collected is a direct first hand information which is tabulated, analyzed and discussed

Demographic Characters

Sex: The selected sample of the present study was distributed according to their sex and presented in Table 1. It is clear that men occupied 36.6 per cent of the total sample, whereas the women constituted 33.4 per cent. The children constituted 30 per cent of the total sample of which 20 per cent were boys and 10 per cent were girls.

Table 1: Distribution of the sample according to their sex

S. No.	Sex	Number	Percentage (%)
1.	Men	22	36.6
2.	Women	20	33.4
3.	Children - Boys	12	20
	- Girls	6	10

Age: The respondents and their corresponding family members were grouped according to their age. From Table 2, it is evident that men constituted 36.6 per cent of the total sample in which 15 per cent belonged to the age group of 30 years and below. The remaining 21.6 per cent belonged to an age group of 30 years and above. The women constituted 33.3 per cent of the total sample in which 20 per cent belonged to an age range of 15-30 years and remaining 13.3 per cent belonged to an age group of above 30 years. The children constituted 30.1 per cent of the total sample of which 11.7 per cent were of 0-5 years of age and remaining 18.4 per cent were of 5-15 years age. This shows that a good percentage of men and women were young and may respond positively to nutrition intervention programme.

Table 2: Distribution of the respondents and their family members according to their age

S.No.	Members of the family	Age group	Number	Percentage
1.	Men	Below 30	9	15
		Above 30	13	21.6
2.	Women	Below 30	12	20
		Above 30	8	13.3
3.	Children	Below 5	7	11.7
		5-15	11	18.4

Educational Status of Women: The distribution of respondents according to their educational level is given in Table 3.

Table 3 clearly shows that one-fourth of the subjects were illiterate (25 per cent), 35 per cent of them were neo-literates whereas 25 per cent of the subjects had elementary school education and 15 per cent of the respondents had high school education. As the sample consists of all categories of women, a non-formal approach of nutrition education and intervention may be more suitable.

Table 3: Distribution of the sample according to their educational level

S. No.	Educational level	Number of respondents	Percentage (%)
1.	Illiterates	5	25
2.	Neo-literates	7	35
3.	Elementary school education	5	25
4.	High school education	3	15

Occupation: Of the selected sample, all were engaged in agriculture and allied occupations, which falls under the category of moderate work.

Monthly Family Income: The selected sample belonged to low income group, but there were some variations. Forty per cent of the respondents had a monthly income of less than Rs.2000/- and another 30 per cent of the respondents had a monthly income between Rs.2001-3000/- and remaining 30 per cent of the respondents were earning a monthly income between Rs.3001-4000/-.

A considerable number (40 percent) of respondents had nuclear families. 30 percent of the respondents were from extended families and remaining 30 percent were from joint families. It was generally believed that joint families tend to be better-off socio-economically due to more number of economic supporters compared to nuclear families such that the health and nutritional status of joint families were likely to be better compared to their nuclear counterparts.

Nutritional Status

The nutritional status of the respondents and their family members was assessed before the nutrition education programme using Anthropometry. The mean heights of the men was found to be 158.05 cms whereas for women it was 152.4 cms and children had a mean height of 83.33 cms.

The degree of lowering in body weight could be used as an indicator of the severity of malnutrition (Gomez 1955). The degree of malnutrition of the respondents and the family members was assessed using Gomez classification. The mean weights of women, men and children were 38.05, 42.27 and 10.86 which were less than their corresponding mean ideal body weights and standard weights, that is, 48.57, 50.82 and 20.1 respectively.

These values showed a significant difference between ideal body weight and actual body weight of the respondents and their family members. According to Gomez (1955), classification the respondents and their family members were classified and given in the Table 4.

Table 4: Distribution of respondents and their family members according to Gomez classification

S. No.	Respondents	Gomez classification			Will nourished
		I° M.N*	II° M.N*	III° MN	
1.	Women	30%	45%	5%	20%
2.	Men	23%	24%	17%	36%
3.	Children	44.4%	16.67%	22.22%	18%

* First degree malnutrition - 90-75% of ideal body weight

* Second degree malnutrition - 75-60% of ideal body weight

* Third degree malnutrition - less than 60% of ideal body weight

Table 4 clearly shows that among women 30 percent belonged to first degree of malnutrition, 45 percent belonged to second degree of malnutrition and 5 percent belonged to third degree or severe malnutrition, whereas remaining 20 percent were well nourished. Out of total men, 23 percent belong to first degree, 24 percent belonged to second degree and 17 percent belonged to third degree of malnutrition and remaining 36 percent of men were well nourished. Among children, 44.4 percent belong to first degree, 16.67 percent to second degree and 22.22 percent to third degree malnutrition and remaining 18 percent were found to be on the margin and just above the ideal body weight.

The mid upper arm circumference, skin fold measurements of children were also less than their corresponding standard values. The mean head circumference of the infant was 34.8 cms, whereas the standard is 42.43 cms. The chest circumference was 34.17 cms whereas the standard is 42.3 cms.

The mean fat fold measurement of the infants was 7.38 which was less than the standard, that is, 9. The mean fat fold measurement of children was 6.97 which was also less than the standard 9.29, that is, it was 75 per cent of the standard. A concerted effort needs to be made to trigger appropriate behavioral changes among the mothers to improve the nutritional status of children and all, the family members.

Nutrition Knowledge of the Women

Nutrition education is the pre-requisition for improving the nutritional status of any group. The nutrition education component helps to develop skills for proper utilization of available food resources. Although nutrition education is a slow process, it can bring long term benefits. Nutrition education was given to women as a part of horticultural nutrition. The six months educational intervention consisted of weekly contact with the beneficiaries, which involved lectures, discussions, skits etc., to encourage targeted categories. Pre and post test measures of nutritional knowledge, dietary behaviours and attitudes related to nutrition and gardening were collected. The scores obtained were statistically analysed using the significance test. The statistical analysis proved that there is a high significant difference between the initial and final scores at 0.05 level of significance with 19 degrees of freedom.

The co-efficient of correlation was calculated for nutritional knowledge acquired by women and their age, annual income and educational status. A positive correlation was found between nutritional knowledge acquired and family income. There was a positive correlation also between educational status of the women and knowledge acquired by them. The women of higher educational status acquired more knowledge than the women of lower educational status. There was a negative correlation between age and nutrition knowledge.

Dietary Intake

It is important to have a detailed knowledge regarding the diets actually eaten by the respondents both for assessing their nutritional adequacy and taking steps for correcting deficiencies in the diets. In the present study ICMR's 24 hour recall method was used to gather information about foods consumed in one day, further

each woman was interviewed about the dietary pattern, frequency of food preparation, frequency of food intake, cooking methods, the quality and quantity of food consumed was taken.

Standardized vessels were used to know the actual amount of food consumed by the individual. The cups were standardized both for volume and raw equivalents for easy estimation. Since the individual shares some amount of the total cooked amount of each preparation for the family as a whole, information was obtained for the family and individual. Data on the recipes and raw amounts of each ingredient used for the preparation by the family was obtained. The total cooked amount and individual intake was assessed by exhibiting the standardized cups before the housewives. Based on this data, raw equivalents of food items and nutritive value of food was calculated.

The subjects' dietary pattern showed that they lacked variety in their diets. Cereals occupied the major part of their diets, followed by pulses and then vegetables. Meat and meat products, oil seeds, sugars and jaggery were consumed fortnightly or monthly, the quantities of their consumption was found to be very low.

Cereals: Among cereals rice is consumed daily by all the families. 23 per cent of the families were consuming wheat throughout the month and 31 per cent of the families were it consuming occasionally. Ragi was consumed more frequently by all the families, twice a week by 14 per cent of the families and thrice a week by 26 per cent. This may be attributed to the increased availability and comparatively low cost in and around Tirupati. Moreover, it is the main staple millet after rice in rural areas of Rayalaseema region. Both *Jowar* and *Bajra* are found to be consumed rarely by most of the families.

Pulses: Of all the pulses red gram dal is consumed more frequently. This may be attributed to their habituation availability of red gram dhal. It was found that 27 percent of the families were consuming red gram dal daily. Pulses like black gram dal, Bengal gram dal and green gram dal were consumed rarely and occasionally accompanied with vegetable curries.

Green Leafy Vegetables: Since ancient times, green leafy vegetables or greens from many plants are being used in the diet. They are nutritionally important and are also economically cheap sources of important nutrients. It was

found that the consumption of green leafy vegetables were relatively high among the families under the study. 42 per cent of the families are consuming greens daily and remaining 52 per cent were consuming twice in a week or occasionally. Though the study area is a drought prone one, more than ten varieties of green leafy vegetables are available all through the year which could be the main reason for regular consumption of green leafy vegetables.

Vegetables: Though vegetables form an essential item of food both for rich and the poor, however in this study it is found that the intake of vegetables were low. Only 60 per cent of the families consume vegetables daily. The commonly consumed vegetables were found to be brinjal, ladies finger, drumsticks and *kovai* which are nutritionally poor.

Roots and Tubers: Roots and tubers were consumed by 20 per cent of the total families daily. Majority of respondents consumed radish, sweet potatoes and potatoes more frequently when compared to other roots.

Meat: Meat is rich in protein and it contains all the amino acids that are required by man. Because of high cost of meat, the consumption of it was found to be low in the respondent families. Among the subjects 60 per cent were consuming once in two weeks and remaining 40 per cent weekly once. It was found that the subjects preferred mutton to chicken.

Fish: The area under study being a drought prone area with meager surface water sources, availability of fish is low. The fresh fish consumption by the subjects was low because of their non-availability in addition to their prohibitive cost. Only 13 per cent were eating fresh fish monthly, while the consumption of dry fish was comparatively more.

Eggs: Eggs have an excellent nutritive value. The egg protein can be easily digested and their quality is comparable to that of meat. But, the consumption of egg was also low because the village under study is located in an area in which the availability of eggs is low, in addition to their high cost. Among all the families only 30 per cent were consuming egg weekly once and remaining 70 per cent once in a fortnight or occasionally.

Milk and Milk Products: Milk is the wholesome food available in nature for good health and promotion of growth. 70 per cent of the families were consuming milk in the form of tea and coffee daily. 46 per cent were consuming milk in

the form of buttermilk, but consumption has been further decreased when it is in the form of curd. The consumption of milk and milk products among the subjects were low, because of prohibitive cost of the milk.

Fats and Oils: Almost all the families were using oil everyday. The quantity of oil used was around 10-15ml per day which is comparatively low. Use of fats was very poor due to high prices of oil not within the reach of the low income groups.

Nuts and Oil Seeds: Nuts and oil seeds were used rarely except for groundnuts. Due to high availability of groundnuts in the area they are consumed in the form of *chutney* once or twice in a week or occasionally.

Fruits: Fruits are good sources of vitamins and minerals. The consumption of the fruits depends on the seasonal availability. The subjects were consuming only those fruits which were grown along-side in their fields. The fruits that were consumed frequently include bananas, papaya and mangoes in addition to country-side indigenous fruits.

Nutrient Intake

The nutrients include energy, proteins, fats, vitamins and minerals. These nutrients are chemical substances which are present in the food we eat daily.

The nutrient intake of the respondent families before and after the nutrition education programme were calculated and compared to that of Recommended Dietary Allowance (R.D.A) of I.C. M. R. (1993b). The percentage of adequacy and deficit were also calculated.

The diet consumed by the families participated in the horticultural nutrition intervention programme was obtained by using 24 hour recall method, as this method was found to be suitable for obtaining the mean nutrient intake of a group when large number of subjects were used.

The nutritive values of the diets consumed by the respondents were calculated and the mean intake of each nutrient before and after the nutrition education programme was compared with the recommended dietary allowances.

Energy: Energy is essential for rest, activity and growth. It is well known that even when a body is at rest, it expends certain amount of energy for essential functions such as respiration, blood circulation, digestion, thermoregulation etc. Quantitative food requirements are usually

estimated in terms of energy, that is, calories. The consumption of energy of diets were worked out with the help of food consumption tables and compared with suggested requirement.

The main intakes of the respondent family members were compared with that of recommended dietary allowances given by ICMR (1993b). The mean energy intakes of the men, women and children of different age groups, recommended dietary allowance of energy and the percentage of adequacy of the percentage of deficits were given in the table. From the Table 5 it is clear that the mean energy intakes of the subjects were less than the R.D.A. 74 per cent of the energy requirement was met by the men, that is, the energy intake was deficit by 26 per cent of the R.D.A. There was a slight increase in the intake of energy after N.E.P. that is, 80 per cent of the energy requirement was met by them. Whereas, in the case of women, the diet was adequate by only 67 per cent of the R.D.A. and deficit by 33 per cent. After N.E.P. there was a slight elevation in the energy intake, that is, it was adequate by 75 per cent and deficit by 25 per cent of the R.D.A. Similarly in the case of children also the intake of energy was increased after N.E.P. In the age group of 13-15 years, there was an increase from 80 per cent to 88 per cent in their adequacy before and after the N.E.P. respectively. This had a positive effect on the dietary intake of energy. This slight change may be attributed to the nutrition education.

The energy deficit may be due to imbalanced dietary intake in which they were adequate only in cereal amounts and were very much inad-

equated in other energy contributing foods like oil, milk etc.

From the above findings, it was confirmed that the target group families had inadequate intakes of calories. The deficit in the calorie consumption even after NEP may be attributed to the low consumption of high concentrated energy rich food especially oils, fats, sugars etc., which will generally exist in high prices that the normal low income people cannot reach them with their low purchasing capacities.

A study conducted and published by Frank et al. (2009) shows that weight loss depends more on consuming fewer calories than the type of foods the dieter avoids. It doesn't matter if a diet is low in carbohydrates, protein or fat as long as the calorie count falls to certain level.

Protein: Proteins are vital to any living organism. Proteins are the important constituent of tissues and cells of the body. Proteins supply, the body building material and helps in the wear and tear of the tissues in the body. Protein as antibodies, help the body to defend living process and carryout a wide range of functions essential for the substance of life. Thus, proteins are one of the most important nutrient required by the body and should be supplied in adequate amounts in the diet. The adequacy of protein in the diet is an important measure of adequacy and quality of a diet.

The mean protein intake of the men, women and children of the target group families, R.D.A. of proteins, their percentage of adequacy and percentage of deficit were given in the Table 6.

Table 5: Comparison of mean energy intakes of respondents and their family members with the R.D.A.

Sample	Energy intake before N.E.P. (K.Cal)	R.D.A. (K.Cal)	Energy intake after N.E.P. (K.cal)	Percentage of adequacy		Percentage of deficit	
				Before NEP	After NEP	Before NEP	After NEP
Men	2140	2875	2280	74	80	26	20
Women	1275	2225	1480	67	75	33	25
Children							
0-6 m*	423	504	447	84	89	16	11
6-12 m*	504	784	548	65	69	35	31
1-3 y@	951	1240	1046	77	85	23	15
4-6 y@	1281	1690	1384	76	82	24	18
7-9 y@	1432	1950	1574	74	81	26	19
10-12 y@	1497	2190	1584	69	73	31	27
13-15 y@	1950	2450	2149	80	88	20	12

*Months

@Years

Table 6: Comparison of mean protein intake of respondents and their family members with the R.D.A.

Sample	Protein intake before (g)	R.D.A. (g)	Protein intake after N.E.P.(g)	Percentage of adequacy		Percentage of deficit	
				Before NEP	After NEP	Before NEP	After NEP
Men	2140	2875	2280	74	80	26	20
Women	35	60	40.5	58	66	42	34
Children	27	50	30.54	54	61	46	39
0-6 m*	8.78	10.25	9.89	85	97	15	3
6-12 m*	8.5	13.2	10.16	64	76	36	24
1-3 y@	15.1	22	18.05	68	82	32	18
4-6 y@	20.3	30	25	67	84	33	16
7-9 y@	32	41	35	78	86	22	14
10-12 y@	41	54	45	76	84	24	16
13-15 y@	54	70	58.5	77	83	23	17

*Months

@Years

Devine et al. (2005) conducted a study on "protein consumption is an important predictor of lower limb bone mass in elderly women and suggest that protein intakes for elderly women" above current recommendations may be necessary to optimize bone mass.

From the data in Table 6 it is clear that the mean protein intake of the subjects were less than the R.D.A. Fifty- eight per cent of the protein requirement was met by men, which increased to 66 per cent after the N.E.P. The intake was deficit by 42 per cent and 34 per cent of the R.D.A. before and after the N.E.P. The women's protein intake was less than that of men. Fifty-four per cent of the protein required was met by them and it was deficit by 46 per cent of the R.D.A. But after the N.E.P. the protein intake was slightly increased to 61 per cent of the R.D.A., that is, the protein intake was deficit by only 39 per cent. The infant's (0-6 months) protein intake was adequate by only 85 per cent which increased to a percentage of 97 after the N.E.P. Similarly, a slight increase in the adequacy of protein was found after N.E.P. in all other age groups of children.

From the above findings it can be concluded that the selected target group were deficit in protein intake. This could be due to consumption of a disproportionate diet, that is, cereal rich diet. Moreover, plant proteins being the major source of protein intake resulted in the inadequate protein. A slight increase in the protein intake after N.E.P. can be attributed to the perception of nutritional knowledge by women.

Fat: Fat is more than twice the energy furnished by other protein or carbohydrate. Pres-

ence of fat in the diet is important for the absorption of fat soluble vitamins. The adequacy for fat was more when compared to other nutrients but less when compared to the R.D.A.

Vitamins: Vitamins are organic substances present in small amounts in many foods. They are required for carrying out many vital functions of the body. The intake of vitamins was also found to be deficit among all age groups. The vitamin A intake was deficit by 24 per cent for men, 30 per cent for women. It was highly inadequate among children, that is, around 30 to 40 per cent. This deficit has decreased to 20 per cent among adults and 15 – 25 per cent among children after the Nutrition Education Programme. There is a significant increase in the consumption of Thiamine rich foods after the Nutrition Education Programme. Similar results were seen in the case of Riboflavin, Niacin and Ascorbic acid also.

Minerals: The mineral intake was also found to be inadequate. Calcium is an essential element required for several life processes. As a structural component calcium is required for the formation and maintenance of skeleton and teeth. The mean calcium intakes of respondents, RDA, the percentage of adequacy and the percentage of deficit are given in Table 7.

The data in the Table 7 shows that the diets consumed by the respondents were deficient in calcium. The men diets were adequate in calcium by 72.31 percent and it has increased to 82.69 percent after the Nutrition Education Programme. The intake of calcium among women was less than that of men and it was meeting 65.12 percent of the RDA and it has increased to

Table 7: Comparison of mean calcium intake of respondents and their family members with the R.D.A.

Sample	Calcium intakes before N.E.P. (mg)	R.D.A. (mg)	Calcium intake after N.E.P. (mg)	Percentage of adequacy		Percentage of deficit	
				Before NEP	After NEP	Before NEP	After NEP
Men	289.25	400	330.74	72.31	82.69	27.69	17.32
Women	260.45	400	284.25	65.12	71.06	34.89	28.94
Children							
0-6 m*	600	500	640.5	120	128	-20	-28
6-12 m*	390.45	500	410.38	88	91	22	17.92
1-3							
4-6 y@	308.75	400	340.47	77.19	85.12	22.81	14.88
7-9							
10-12 y@	497.25	600	511.45	82.88	85.24	17.13	14.76
13-15 y@	509.59	600	520.68	84.94	86.78	15.07	13.22

*Months

@Years

71.06 percent after the NEP. The infants of 0-6 yrs were showed adequate intake of calcium. This may be because the human milk is a rich source of calcium. The calcium intake of children of 6-12 months was deficit by 88 percent of the RDA and it has increased to 91.08 percent after the NEP. Among the children of 1-9 years, the calcium intake was meeting 77.19 percent and 85.12 percent of the RDA before and after the NEP respectively. The children of 10-12 years were consuming a diet that was deficit by 17.13 percent and slight decrease was noticed after NEP, that is, 14.76 percent. The children of 13-15 years were consuming diets which met the calcium requirement by 84.94 percent of the RDA. It has slightly increased to 86.78 percent after the NEP.

Iron: Iron is an essential element for the formation of haemoglobin of red blood cells and plays an important role in the transport of oxygen. The iron intakes of the respondents were lower than their R.D.A. In spite of the high consumption of *ragi* by the target group, a deficit in iron intake was found among the subjects. This may be attributed to the reason that *ragi*, a very good source of iron gets contaminated with dust etc., the true contents of these grains are often lower than the values obtained by analysis of the market samples, contaminant iron which is often not available at all may constitute 20-30 percent of the total iron present in food as purchased.

CONCLUSION

The dietary intakes of energy, protein, fat, vitamin A, Thiamin, riboflavin, niacin, ascorbic acid, calcium and iron of respondents and their family members were below the R.D.A. The study

was carried out for a short period, that is, six months, hence the intakes though not markedly increased, brought a positive change in the nutritional knowledge of the focus group and in the dietary intakes. This positive trend in dietary intakes indicate that the horticultural, nutrition intervention programme which made perishables viz., vegetables and fruits available to the families under study is an effective one. The horticultural nutrition intervention programme can bring about satisfactory results in the nutritional status of the families if it is properly monitored and followed up.

RECOMMENDATIONS

Nutrition is an input into development. Nutrition is considered critical for women and economic development and its neglect would adversely impact on health, cognitive development of children, productivity of people, economic growth and slow pace of national development. Nutrition agenda, therefore, needs to be given high priority with greater investment for accelerating human and national development. Non-consumption of valuable ethnic foods may lead to non-production of those foods due to lack of demand. Over a period, these foods may disappear from our homes, markets and ecosystem itself. Promotion of local nutritious food consumption should be incorporated in the nutrition intervention programs.

Families should be helped by field level functionaries of ICDS and PHCs to assess; what they eat, their nutritional status, identify their nutritional behavioral risk factors and seek guidance to modify their food habits to promote their health.

REFERENCES

- Black RE, Allen LH, Bhutta ZA et al. 2008. Maternal and child undernutrition and survival. *Lancet*, 371(9608): 243.
- Devine Amanda, Dive Ian M, Islam Amirul FM, Dharwal Satvinales S, Prince Richard L. 2005. Protein consumption is an important predictor of lower limb bone mass in elderly women. *The American Journal of Clinical Nutrition*, 81(6): 1423- 1428.
- Frank M, Sacs MD, George A, Bray MD et al. 2009. Comparison of weight-loss diets with different Compositions of fat, protein and carbohydrates. *The New England Journal of Medicine*, 360: 859-873.
- Gomez F, Galvan RR, Crarioto J, Frank S 1955. Malnutrition in infancy and childhood, with special reference to Kwashiorkar. *Advanced Pediatrics*, 7: 131-169.
- ICMR 1993a. *Nutritive Value of Indian Foods*. Hyderabad: National Institute of Nutrition (ICMR).
- ICMR 1993b. *Recommended Dietary Intake of Indians*. Hyderabad: National Institute of Nutrition (ICMR).
- Ruel MT 2008 Addressing the underlying determinants of undernutrition. Examples of successful integration of nutrition in poverty reduction and agriculture strategies. *SCN News*, No 36, pp. 21-29.
- Sridevi V 1989. *Knowledge, Attitudes and Practices of Nutrition among Adult Education Programme Instructors in Andhra Pradesh*. Ph.D. Thesis, Unpublished. Tirupati: S.V. University.
- Veneman AH 2008. 35th SCN Session (Hanoi 2008) Opening Speech by the SCN Chair, *SCN News*, No. 36 Mid-2008:4 Un Systems. From <[http://www.unsystem.org/scn/publications/scn news 36.pdf](http://www.unsystem.org/scn/publications/scn%20news%2036.pdf)> (Retrieved on January 23, 2008).