4

RESULTS AND DISCUSSION

The results obtained in the present study on **Prevalence of Micronutrient Deficiencies Among Self Help Group Women and the Impact of Interventions** are discussed under the following headings:

A. Socio-Economic Profile, Dietary Background and Nutritional Knowledge of the Selected Self Help Group (SHG) Women

1. Socioeconomic Background of the SHG Women
2. Dietary Pattern among the Selected SHG Families
3. Nutritional Awareness among the Selected SHG Women
4. Health Problems among the selected SHG Women
5. Details Regarding the Participation of Women in SHG

B. Health and Nutritional Status of the SHG Women

1. Anthropometric Measurements of the Selected SHG Women
2. Clinical Examination of the Selected SHG Women
3. Biochemical Parameters of the Selected SHG Women
4. Food and Nutrient intake of the Selected SHG Women

C. Details of Nutritional Interventions – Supplementation of Nutritious Mixes

1. Acceptability Scores of the Formulated Nutritious Mixes
2. Nutrient Content of the Formulated Nutritious Mixes
3. Antinutritional Factors in the Formulated Nutritious Mixes
4. Shelf Life of the Formulated Nutritious Mixes
5. Cost Analysis of the Formulated Nutritious Mixes

D. Impact of Supplementation of Nutritious Mixes among the SHG Women

1. Anthropometric Measurements of the SHG Women
2. Clinical Examination of the SHG Women
3. Biochemical Parameters of the SHG Women

E. Impact of Nutrition Education among the SHG Women

1. Knowledge, Attitude and Practice (KAP) Scores of the SHG Women

A. Socio-Economic Profile, Dietary Background and Nutritional Knowledge of the Selected SHG Women

1. Socioeconomic Background of the SHG Women

The socio-economic background of the SHG Women is discussed in terms of age, educational status, occupation, type and size of families, monthly income, marital status and food expenditure pattern.

a. Age of the Selected SHG Women

Table II and Figure 3 provide information on the age wise distribution of the selected Self Help Group women from the selected two blocks of Coimbatore District.

TABLE - II

AGE WISE DISTRIBUTION OF THE SELECTED SHG WOMEN

Age in Years	Periyanaicken palayam Block		Karamadai Block		Total	
	N	%	N	%	N	%
30 – 34	115	23	126	25	241	24
35 – 40	254	51	254	51	508	51
41 – 45	131	26	120	24	251	25
Total	**500**	**100**	**500**	**100**	**1000**	**100**

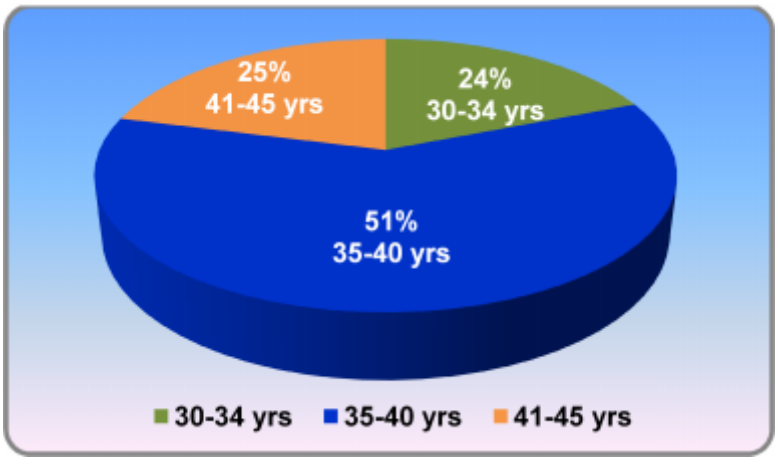

FIGURE 3 – AGEWISE DISTRIBUTION OF THE SELECTED SHG WOMEN

There is not much difference in the distribution of members according to age in both Periyanaickanpalayam and Karamadai Blocks. In both the areas majority of the SHG women (51%) were in the age group of 35-40 years and 25 per cent were in the age group of 41 – 45 years. Only 24 per cent were in the age group of 30-34 years. In general among both the areas SHG women in the age group of 35-40 years were the majority. Jerinabi (2006) observed that women in the age group of 31 -40 years were found in large numbers both in urban as well as in rural areas.

b. Educational Status of the SHG Women

Educational status of the selected SHG women is given in Table III and Figure 4.

TABLE - III

EDUCATIONAL STATUS OF THE SELECTED SHG WOMEN

Level of Education	Periyanaicken palayam Block		Karamadai Block		Total	
	N	**%**	**N**	**%**	**N**	**%**
Primary school	150	30	200	40	350	35
Middle school	180	36	140	28	320	32
Secondary school	60	12	80	16	140	14
Higher Secondary school	40	8	20	4	60	6
Diploma	30	6	20	4	50	5
Degree	10	2	20	4	30	3
Illiterate	30	6	20	4	50	5
Total	**500**	**100**	**500**	**100**	**1000**	**100**

The educational status of the selected SHG women revealed that, majority of the women (35%) were educated up to primary school, followed by 32 per cent studied up to middle school education, 14 per cent studied up to secondary school education and only 3 per cent studied up to degree evel. In spite of all Governmental efforts still 5 per cent of women were uneducated. In Periyanaickenpalyam block majority of the women (36%) have studied up to middle school education. In Karamadai Block majority of the women (40%) have studied only up to primary school education.

According to the Census of India (2011) the female literacy rate in rural areas and urban areas was found to be 57.93 per cent and 79.11 per cent respectively.

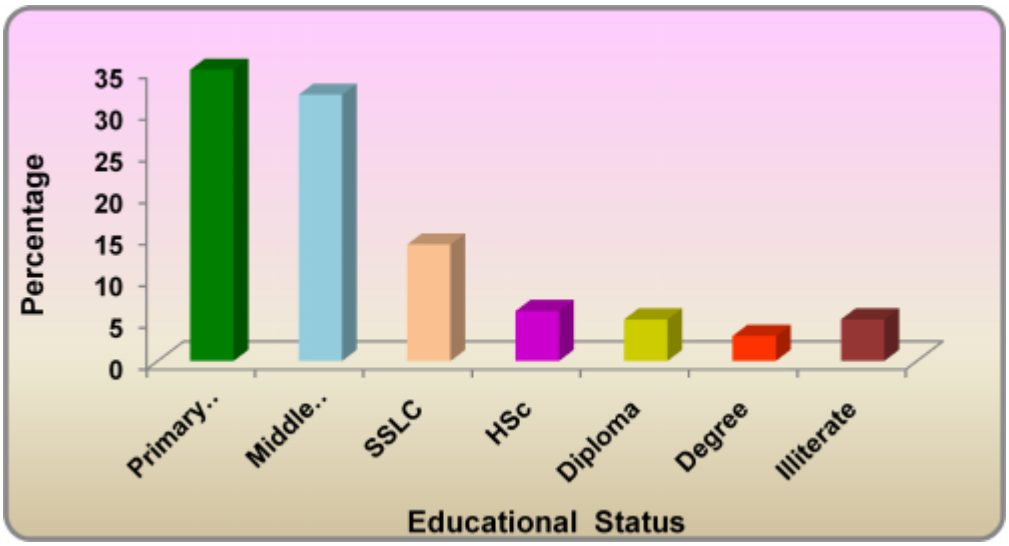

FIGURE 4 – EDUCATIONAL STATUS OF THE SELECTED SHG WOMEN

Just over 55 per cent of de facto women aged 15-49 years are literates, compared with 78 per cent of de facto men in the same age group. In the present study only 5 per cent of women are found to be illiterates. It is a welcome observation.

c. Occupation of the SHG Women

Table IV presents the occupational status of the selected SHG Women from the two blocks.

TABLE - IV

OCCUPATION OF THE SELECTED SHG WOMEN

Details	Periyanaicken palayam Block		Karamadai Block		Total	
	N	%	N	%	N	%
Daily wages	180	36	140	28	320	32
Agriculture	50	10	96	19	146	15
Vegetable business	20	4	10	2	30	3
Cloth business	25	5	15	3	40	4
Tailoring shop	10	2	10	2	20	2
Juice stall	20	4	-	-	20	2
No employment	195	39	229	46	424	42
Total	**500**	**100**	**500**	**100**	**1000**	**100**

The occupational pattern of the selected SHG women showed that a maximum of 42 per cent were unemployed, followed by 32 per cent of women working on daily basis, whereas 15 per cent were involved in agricultural activities and only 11 per cent were self employed in cloth business, vegetable business, tailoring shop and juice stall. In general, the type of occupation among the SHG women are not very remunerative and hence they needed some financial support through SHGs.

d. Monthly Income of the Families of the Selected SHG Women

Monthly income of the families of the selected Self Help Group Women as per the classification of the 11th Five Year Plan 2007-2012 is given in Table V and Figure 5.

TABLE - V

MONTHLY INCOME OF THE FAMILIES OF THE SELECTED SHG WOMEN

Monthly income in Rs. *	Periyanaickenpalayam Block		Karamadai Block		Total	
	N	%	N	%	N	%
<3300	290	58	186	37	476	48
3301-7300	116	23	226	45	342	34
7301 – 14,500	84	17	84	17	168	17
>14500	10	2	4	1	14	1
Total	**500**	**100**	**500**	**100**	**1000**	**100**

* 11th Five year plan 2007 – 2012

The income level of majority of 48 per cent of the families of the SHG women in both the areas belonged to very low income category with less than Rs. 3300 per month, followed by 34 per cent of the families belonging to the low income category with Rs. 3301- 7300 per month. Only 17 per cent of the families studied, belonged to the middle income category with Rs. 7301- 14,000 per month as per the 11th five year plan 2007 – 2012 classification.

In Periyanaickenpalayam block a majority of 58 per cent of the families belonged to very low income category, whereas in Karamadai block a majority of 45 per cent of the families belonged to low income category. Survey conducted by Rajesh Pandathil (2015) among the rural families found out that a majority of 74.5 per cent of the households monthly income of their highest earning member was less than Rs 5,000.

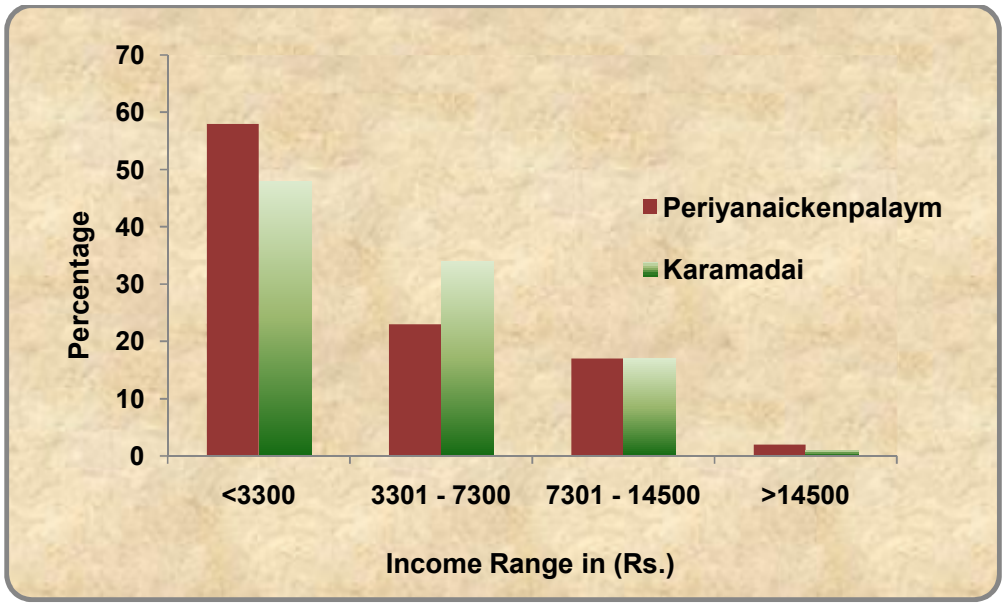

FIGURE 5 – MONTHLY INCOME OF THE FAMILIES OF THE SELECTED SHG WOMEN

The survey conducted by Socio-Economic and Caste Census (SECC) during 2011-2012 in rural India reports that a staggering 92 per cent of rural households had their maximum income to be below Rs 10,000 per month. Nearly three quarters of all rural households said that the income of the highest earning member was Rs 5,000 or less (Subodh Varma, 2015).

e. Type and Size of the Families of the selected SHG Women

Information on the type and size of the families of the selected SHG women are presented in Table VI.

TABLE - VI

TYPE AND SIZE OF THE FAMILIES OF THE SELECTED SHG WOMEN

Details	Periyanaicken palayam Block		Karamadai Block		Total	
	N	%	N	%	N	%
Type of family						
Joint	65	13	85	17	150	15
Nuclear	435	87	415	83	850	85
Total	**500**	**100**	**500**	**100**	**1000**	**100**
Size of the family						
3-4 members	347	69	404	81	751	75
5-6 members	85	17	61	12	146	15
>6 members	68	14	35	7	103	10
Total	**500**	**100**	**500**	**100**	**1000**	**100**

The present day trend of more inclination towards nuclear families and declining joint families is also evident in the present study with 85 per cent being nuclear families and 15 per cent joint families. Nuclear family units are preferred by people to have more independent living and also due to changing trends of family system in both urban and rural areas. A majority of 75 per cent of the families in both the areas had a family size of three to four members. About 15 per cent of the families had 5- 6 members in their families and only 10 per cent of the families had more than 6 members.

As per the NFHS – 3 survey three in five households in India are nuclear. The proportion of nuclear households is higher in urban areas (63%) than in rural areas (59%). Health status of the females of the nuclear family is poor as compared to that of the females of the joint family (Bansal *et al*.,2014). Though joint families have more benefits, now a days people prefer nuclear families for many other reasons.

f. Monthly Expenditure Pattern

Table VII shows the monthly expenditure pattern of the families of the selected SHG women in Periyanaickenpalayam Block.

TABLE – VII

MONTHLY EXPENDITURE PATTERN OF THE FAMILIES OF THE SELECTED SHG WOMEN IN PERIYANAICKENPALAYAM BLOCK

Items	Range of Expenditure (in per cent)	Families	
		N	%
Food	<25	61	12
	26-50	250	50
	51-75	189	38
Clothing	<10	310	62
	11-15	120	24
	15 – 20	70	14
House rent	Nil	70	14
	5 -10	381	76
	11-15	49	10
Education	<10	165	33
	11-20	295	59
	21-30	40	8
Medicine	<5	395	79
	6-10	105	21
Fuel and light	<10	400	80
	11-20	100	20
Transport	<5	421	84
	6-10	79	16
Savings	<10	125	25
	11-20	229	46
	21-30	146	29
Recreation	<5	456	91
	6-10	44	9
Durable goods	<5	423	85
	6-10	77	15

It is observed that among the families studied, 50 per cent of the families spent 26-50 per cent of their income on food. Studies conducted by Sekhampu and Niyimbanira (2013) showed that food represented the single largest expense, accounting for 45.5 per cent of total monthly expenses among South African township of Bophelong.

More than 60 per cent of the families spent less than 10 per cent of their income on clothing and 76 per cent spent 5- 10 per cent of their income on house rent. Fourteen per cent had their own houses and so did not spend much on rent. Majority of the families ie., around 59 per cent spent 11- 20 per cent of their income on education. More than 75 per cent of the families spent less than 5 per cent of their income on medicine. About 80 per cent of the families spent less than 10 per cent of their income on fuel and light. Majority of the families (84%) spent less than 5 per cent of their income on transport, recreation (91%) and on durable goods (85%). About 46 per cent of the families of SHG women saved 11 – 20 per cent of their income; this might be due to their participation in SHG activities. It is appreciable to note that 29 per cent of families saved 21 – 30 percent of their income. It is encouraging to note that all the women had the habit of savings based on their income level.

Table VIII shows the monthly expenditure pattern of the families of the selected SHG women in Karamadai Block.

TABLE – VIII

MONTHLY EXPENDITURE PATTERN OF THE FAMILIES OF THE SELECTED SHG WOMEN IN KARAMADAI BLOCK

Items	Range of Expenditure (in per cent)	Families	
		N	%
Food	<25	55	11
	26-50	210	42
	51-75	235	47
Clothing	<10	355	71
	11-15	105	21
	15-20	40	8
House rent	Nil	120	24
	5-10	280	56
	10-15	100	20
Education	<10	185	37
	11-20	295	59
	21-30	20	4
Medicine	<5	365	73
	6-10	135	27
Fuel and light	<10	425	85
	11-20	75	15
Transport	<5	445	89
	6-10	55	11
Savings	<10	150	30
	11-20	255	51
	21-30	95	19
Recreation	<5	482	96
	6-10	18	4
Durable goods	<5	435	87
	6-10	65	13

In Karamadai block 47 per cent of the women spent 51-75 per cent of their income on food. More than 70 per cent of the families spent less than 10 per cent of their income on clothing. A majority of the women (56%) spent 5- 10 per cent of their income for house rent. Nearly one fourth (24%) of the families had their own house and hence no expenditure on food. About 11-20 per cent of their income was spent on education by a majority of families (59%). In most of the families they stick on to their traditional home remedy methods for the treatment of minor ailments. Hence the expenditure on medicine was found to be less than 5 per cent among the 73 per cent of the families. The expenditure on fuel and light was also found to be less than 10 per cent in 85 per cent of the families. More than 85 per cent of the families spent less than 5 per cent of their income on transport and 51 per cent spent 11 – 20 per cent of their income on savings. It is found that 96 per cent and 87 per cent of the families spent less than 5 per cent of their income on recreation and durable goods respectively.

2. Dietary Pattern among the Families of the Selected SHG Women

a. Food Consumption Pattern, Frequency of Meal and Menu Planning

The pattern of food consumption, frequency of meal and menu planning of the families of the selected SHG women is given in Table IX.

TABLE - IX

FOOD CONSUMPTION PATTERN AMONG THE FAMILIES OF THE SELECTED SHG WOMEN

Details	Periyanaickenpalayam block		Karamadai block		Total	
	N	%	N	%	N	%
Food Consumption pattern						
Vegetarian	62	12	50	10	112	11
Non-vegetarian	430	86	439	88	869	87
Ova-vegetarian	8	2	11	2	19	2
Total	**500**	**100**	**500**	**100**	**1000**	**100**
Frequency of meal						
2 meals	190	38	196	39	386	39
3 meals	302	60	290	58	592	59
4 meals	8	2	14	3	22	2
Total	**500**	**100**	**500**	**100**	**1000**	**100**
Menu planning done in advance						
Yes	288	58	316	63	604	60
No	212	42	184	37	396	40
Total	**500**	**100**	**500**	**100**	**1000**	**100**

Among the 1000 families of SHG women studied, 87 per cent were non vegetarians but their intake of non vegetarian items was very less, mostly once a week. Only 11 per cent of the families were vegetarians. Ova vegetarian families comprised only 2 per cent of the surveyed women. Non vegetarian families predominated among both Periyanaickenpalayam and Karamadai block in comparison with the vegetarian families.

With regard to the frequency of meal consumed, a majority of 59 per cent of the families of SHG women followed 3 meal pattern, whereas 39 per cent of the families followed 2 meal pattern and only 2 per cent of the families followed 4 meal pattern.

It is surprising to note that 60 per cent of families of SHG women planned their menu in advance, in order to save time, to work smoothly at home and to go to work in time. They planned their menu depending upon the availability of the foods and likes and dislikes of their family members.

b. Mode of Food Selection and Foods Produced at Home

Majority of the SHG women in Periyanaickenpalayam and Karamadai Block (53% and 56%) selected and purchased foods based on the availability. Only 13 per cent in Periyanaickenpalayam block and 10 per cent in Karamadai block selected foods based on nutrients. In both the blocks 34 per cent of women selected inexpensive foods.

Only a less percentage of the families of SHG women (3.6%) in Periyanaickenpalayam and Karamadai block possessed kitchen garden. Among the families with kitchen garden, only 2 per cent of the families produced less than 5 kg of vegetables per month. A very low percentage of women had poultry and dairy farm and they also produced less than 15 eggs per month and less than 40 litres of milk was obtained by 0.3 per cent of the families

c. Foods Given under Special Conditions

Food pattern followed by the families of the selected SHG Women under special conditions is presented in Table X.

TABLE - X

FOODS GIVEN AND AVOIDED UNDER SPECIAL CONDITIONS

Age group	Foods included	Reasons	Foods avoided	Reasons
Infants	Milk	For health	Cereals	Difficult to chew
Weaning infants	Rice, idli, Mashed foods, slices of soft fruits	Easy to digest, easily available, soft diet	Egg, Salty and sugary foods, nuts	Difficult to digest, cause irritation in stomach
Pre-schoolers	Egg, milk, Pulses	For growth and immunity	Hot and spicy foods, sweets and snacks and carbonated drinks	Cause irritation and stomach disturbances, damage teeth
Teen agers	Fruits, vegetables, milk and nuts	Good for health and strength	Fatty foods and foods rich in salt and sugar, fast foods	Over weight
Women	Rice, wheat, ragi, fruits, vegetables	Gives energy to do work	Fatty foods	Leads to overweight and obesity
Pregnant mothers	Egg,Garlic and Greens	For health, to prevent constipation	Papaya, pine apple, gingelly seeds	Leads to abortion, produces heat
Lactating mothers	Garlic, dry fish, jaggery	For milk secretion, to relieve back pain	Brinjal, Salty foods	Cause allergy to the child
Old age	Ragi, Rice-porridge	Healthy diet, easy to eat	Crispy and oily foods	Difficult to chew

During infancy, cow's milk was the major food given by the mothers and they considered milk as essential for healthy living. Cereals were avoided, because they thought solid foods are difficult to chew. Weaning infants were given idli, rice, mashed foods, slices of soft fruits because they are easily digested, easily available and soft to eat. Egg, salty and sugary foods and nuts were not included during the early stages of infancy since they are difficult to digest. Preschoolers were given egg, milk and pulses, because these foods help them for growth and hot and spicy foods were avoided because they may cause irritation and stomach disturbances. Foods included for teen agers were fruits, vegetables, milk and nuts and all other foods, but their intake was found to be low. Some of the foods like fatty foods, salt and sugary foods and fast foods were avoided for teen agers. Rice, wheat, ragi, fruits and vegetables were included in the diet of women in order to give energy, fatty foods were avoided by majority of the women, because they thought that these foods may increase their weight.

During pregnancy, vegetables, egg and non vegetarian foods were given for general improvement of health. Foods avoided during pregnancy included papaya, pine apple and gingelly seeds, because these foods were believed to cause abortion by producing heat. Foods like garlic, greens and dry fish were given to lactating mothers to produce more milk and to prevent constipation. Senior people were mostly given rice and ragi porridge, because they are easy to consume and easily digestible. Crispy foods and oily foods were avoided because they found them difficult to chew or bite or indigestible by them. In both the areas under study food pattern was modified according to the age group.

d. Order of Preference in Feeding the Family Members

Among a majority of 85 per cent of the families the head of the family was given first preference in feeding food, because of our tradition and custom and they are the bread winners of the families.

Some families gave first preference to children (32%) while feeding because they are young and they go to school .

Only 10 per cent of families gave first preference to old people while feeding because they belonged to vulnerable group and they become hungry quickly.

A majority of the women, 70 per cent preferred to eat last, because they considered it as a custom and they eat the left-over food.

e. Type and Quantity of Beverages Consumed by the Selected SHG Women

The details regarding the type and quantity of beverages consumed by the selected SHG women is given in Table XI.

TABLE – XI

TYPE AND QUANTITY OF BEVERAGES CONSUMED BY THE SELECTED SHG WOMEN

Beverages	Periyanaickenpalayam Block		Karamadai Block		Total	
	N	%	N	%	N	%
Coffee						
<2 cups	10	2	13	3	23	2
2-4 cups	189	38	201	40	390	39
Tea						
<2 cups	15	3	25	5	39	4
2-4 cups	160	32	194	39	354	35
Milk						
<2 cups	62	12	36	7	98	10
2-4 cups	33	7	24	5	57	6
Commercial formulas						
<2 cups	31	6	7	1	38	4
2-4 cups	-	-	-	-	-	-
Total	**500**	**100**	**500**	**100**	**1000**	**100**

Survey on the type and quantity of the beverages consumed by the selected SHG women revealed that majority of the women in both the areas had the habit of consuming beverages. A majority of 39 per cent of women studied preferred to drink 2-4 cups of coffee in a day, whereas 35 per cent of the women had the habit of taking 2-4 cups of tea in a day. Only 10 per cent of the women consumed less

than 2 cups of milk per day. The intake of commercial formulas was found to be only 4 per cent among the selected SHG women. In general, coffee and tea were the preferred beverages among the SHG women.

f. Frequency of Foods Included in the Diet

Table XII depicts the frequency of foods included in the diet of the surveyed families of SHG women.

TABLE – XII

FREQUENCY OF FOODS INCLUDED IN THE DIET OF FAMILIES OF SHG WOMEN (in percentage)

Food items	Daily	Twice a week	Weekly once	Monthly once	Occasionally
Cereals					
Rice	100	-	-	-	-
Wheat	-	23	20	39	18
Ragi	-	13	18	23	46
Wheat Rava	-	10	45	23	22
Semolina	-	-	62	23	15
Pulses					
Red gram dhal	72	12	16	-	-
Bengal gram dhal	22	25	10	15	28
Green gram dhal	-	10	22	52	16
Black gram dhal	-	25	36	26	13
Channa	-	10	28	48	14
Soya bean	-	-	10	25	65
Leafy vegetables					
Drumstick	-	12	40	40	8
Amaranth	-	28	33	39	-
Agathi	-	-	27	47	26
Manathakkali	-	16	29	40	15

Food items	Daily	Twice a week	Weekly once	Monthly once	Occasionally
Vegetables					
Beans	10	28	41	14	7
Cabbage	-	16	46	15	23
Drumstick	-	15	37	26	22
Ladies finger	-	18	34	34	14
Melons	-	17	23	32	28
others	12	32	40	12	4
Fruits					
Amla	-	15	15	32	38
Watermelon	-	-	20	38	42
Apple	-	-	22	40	38
Tomato	18	25	32	15	10
Guava	25	20	18	21	16
Pine apple	-	-	7	28	65
Orange	20	18	14	32	16
Papaya	-	16	22	38	24
Grapes	-	16	20	28	36
Pomegranate	-	7	15	28	40
Banana	23	28	21	18	-
Roots and Tubers					
Carrot	-	32	28	18	22
Potato	-	25	42	12	21
Beetroot	-	28	46	18	8
Onion	100	-	-	-	-
Nuts and oil seeds					
Groundnut	-	15	28	42	15
Badam	-	-	8	18	64
Coconut	22	48	18	8	4
Cashewnuts	10	8	16	42	24
Dates	8	17	20	39	16

Food items	Daily	Twice a week	Weekly once	Monthly once	Occasionally
Meat and Poultry					
Egg	-	25	18	39	18
Mutton	-	18	18	42	22
Chicken	-	16	29	39	16
Fish	-	-	7	49	42
Sweets					
Sugar	100	-	-	-	-
Jaggery	-	15	22	36	27
Honey	-	-	-	26	74
Milk and Milk products					
Milk	36	22	24	10	8
Curd	58	13	12	8	9
Ghee	-	-	13	20	67
Butter	-	-	8	26	56
Paneer	-	-	12	36	52
Buttermilk	69	10	13	8	-

Details regarding the frequency of foods included in the diet showed that the families preferred to include rice in their daily diet. A majority of 46 per cent of the families consumed ragi occasionally whereas wheat was consumed by 23 per cent of the families weekly twice. Monthly consumption of wheat was found to be 39 per cent among the selected families. Prabhat and Begum (2012) studied the food consumption pattern of the women engaged in beedi making, mason work, maids etc indicated that cereals was consumed daily and pulses were consumed 2 times a week. Family income and knowledge about foods and their requirements play an important role in the selection of food among the women studied.

Similarly the daily consumption of pulses like red gram dhal was found among a majority of 72 per cent of the families. Only 10 per cent of the families consumed Bengal gram dhal weekly once. Majority of them consumed greens like drumstick, amaranth, agathi and manthakkali once in a month or weekly once.

The frequency of consumption of vegetables among majority of the families was found to be weekly once or twice a week. Similarly fruit consumption was not more frequent, the intake was monthly once or weekly once. The intake of guava and orange was found to daily by 25 and 20 per cent of the women respectively. Lakshmi and Babitha (2014) also observed that consumption of fruits and other vegetables was found to be less among the women studied.

Onion was included in the diet daily. Root vegetables like carrot, potato and beetroot were consumed by the families but not daily. Majority of the families (64%) consumed badam occasionally, 42 per cent of the families included groundnut once in a month, the daily consumption of coconut was found among 22 per cent of the selected families.

The consumption of non- vegetarian foods like mutton (42%), chicken (39%) and fish (49%) monthly once was found among the selected families. A majority (42%) of them consumed fish occasionally. Egg was taken twice a week by 25 per cent of the families.

All the families preferred to include sugar in their diet, since it is available through Public Distribution System. Only 36 per cent of the families consumed jaggery once in a month and 27 per cent of the families took jaggery occasionally. A majority of the families (74%) consumed honey occasionally. Jaggery was found to be consumed either monthly or occasionally by majority of the families in both the areas. Most of the families consumed milk, curd or buttermilk daily.

In general, the intake of micronutrient rich foods like vegetables and fruits was inadequate among the selected families of SHG women. The nutritious foods like greens, vegetables, ragi, jaggery and fruits were consumed once in a month or weekly once.

g. Foods Included During Illness

Table XIII gives the details about the foods included during illness as reported by the selected families of SHG women.

TABLE - XIII

FOODS INCLUDED DURING ILLNESS BY THE FAMILIES OF SHG WOMEN

Conditions	Foods included*	Per cent stating	Reasons	Per cent stating
Fever	Rice porridge	49	Easy digestion	29
	Bread and milk	18	Energy giving	6
	Rasam Rice	15		
	Idli	15	Quick recovery	37
Diarrhoea	Sugar water	32	Stop diarrhoea	59
	Tender coconut water	13		
	Buttermilk	27		
	Porridge	14		
Constipation	Banana	41	Normal elimination	33
	Greens	28		
	Porridge	14		
	Buttermilk	4		
Chickenpox	Curd rice	31	Quick recovery	24
	Tender coconut water	27	Cool the body	20
	Buttermilk	9	Give energy	7
	Porridge	4		

* - Multiple response

A majority of 49 per cent of the families were of the opinion that rice porridge was good for fever. Other items like bread and milk, rasam rice and idli were also suggested by 18,15 and 15 per cent of the women respectively for reasons such as easy digestion and energy yielding.

The various foods suggested by the SHG women for diarrhoea were sugar water (32%) Tender coconut water (13%) buttermilk (27%) and porridge (14%)

with an opinion that they would arrest diarrhoea. More percentage (41%) of the women included banana to avoid constipation. Foods like greens, porridge and buttermilk were also included by 4 to 28 per cent of SHG women to avoid constipation. In the case of chicken pox, 31 per cent of women suggested to include curd rice, 27 per cent suggested tender coconut water, 9 per cent stated to take buttermilk and only 4 per cent reported to include porridge in the diet to cool the body and for quick recovery.

h. Foods Avoided During Illness

Table XIV gives the details about the foods to be avoided during illness as reported by the selected SHG women.

TABLE - XIV

FOODS AVOIDED DURING ILLNESS

Conditions	Foods avoided*	Per cent stating	Reasons	Per cent stating
Fever	Non-vegetarian foods	37	Aggravate fever	40
	Oily foods	16	Cause indigestion	25
	Ice cream	10		
	Buttermilk	27		
	Cool drinks	4		
Diarrhoea	Spicy foods	31	Aggravate the condition	27
	Oily foods	6		
Constipation	Solid foods	20	Avoid constipation	7
	Potato	9		
	Oily foods	2		
Chickenpox	Seasonings	39	Cause irritation	29
	Spicy foods	15	Cause vomitting	8
	Salty foods	14		
	Non-vegerarian foods	5		

* - Multiple response

Non vegetarian foods by majority (37%) of women and oily foods, ice cream, butter milk and cool drinks were avoided during fever for reasons such as indigestion and may increase body temperature. During diarrhoea, spicy foods were excluded by 31 per cent of the women as they worsened the condition. About 20 per cent of the women were of the opinion that solid foods should not be given during constipation.

Foods avoided during chicken pox by majority of the families were seasoned foods (39%), spicy foods, salty foods and non vegetarian foods with the reason that they caused vomiting and irritation of the gastro intestinal tract. Thus SHG women had some beliefs about foods to be avoided during illness.

i. Monthly Food Expenditure Pattern

The monthly food expenditure pattern of the families of SHG women in both blocks studied is presented in Table XV.

TABLE - XV

FOOD EXPENDITURE PATTERN OF THE FAMILES STUDIED

(No:1000)

Food	Percentage of food expenditure	Percentage of families
Cereals	<30	40
	31-40	45
	41-50	13
	>51	2
Pulses	<10	22
	11-20	63
	21-30	7
	>31	8
Green Leafy Vegetables	Nil	4
	<1	10
	2-3	48
	4-5	23
	>6	15

Food	Percentage of food expenditure	Percentage of families
Other vegetables	Nil	17
	<1	12
	2-3	42
	4-5	22
	>6	7
Fruits	Nil	4
	<1	32
	2-3	33
	4-5	24
	>6	7
Nuts and Oils	Nil	10
	<10	20
	11-20	60
	21`-30	10
Fleshy Foods	Nil	5
	<10	60
	11-20	30
	21-30	5
Milk and milk products	Nil	2
	<10	65
	11-20	30
	21-30	3
Sugar and Jaggery	Nil	5
	<1	30
	2-3	45
	4-5	20
Beverages	Nil	5
	<1	35
	2-3	60

A maximum of 45 per cent of the families spent 31-40 per cent of their monthly income on cereals and 63 per cent of the families spent 11-20 per cent of income on pulses. With regard to green leafy vegetables, a maximum of 48 per cent of women spent 2-3 per cent of their monthly income. Similarly 2-3 per cent of

income was spent on other vegetables and fruits by a maximum of 42 and 33 per cent of families. Expenditure on nuts and oils was found to be 11-20 per cent among 60 per cent of families. A majority of 60 and 65 per cent of families respectively spent less than 10 per cent on fleshy foods and milk and milk products. Expenditure on sugar and jaggery and beverages occupied 2-3 per cent among majority of families. Food expenditure pattern revealed that green leafy vegetables, other vegetables, fruits and milk and milk products were purchased less by the families. These food groups need to be given greater importance since they are protective foods, which can prevent micronutrient deficiencies.

3. Nutritional Awareness Among the Selected SHG Women

a. Awareness on Nutritional aspects

Table XVI presents the nutritional awareness of the selected SHG Women

TABLE - XVI

AWARENESS ON NUTRITION AMONG THE SELECTED SHG WOMEN

Aspects*	N	%
Importance of nutrition	120	11
Balanced diet	160	15
Nutritional deficiencies	120	11
Ways to correct the nutritional deficiencies	150	14
Foods rich in micronutrients	80	8
Ignorant about the nutrition facts	430	41

* - Multiple response

Study on the nutritional awareness among the SHG women revealed that 43 per cent of the women were ignorant about the nutrition facts. Awareness about the importance of nutrition and the effect of nutritional deficiencies was found to be less (12%) among the selected women. Only 15 per cent of the women were aware of the ways to correct the nutritional deficiencies, 16 per cent were aware of the balanced diet and only 8 per cent of the women were aware of the foods rich in

some of the micronutrients. The overall nutritional knowledge of the women in both the areas was found to be not satisfactory, hence nutrition education is important for these women to help them to select proper foods to lead a healthy living.

b. Awareness about Foods and Nutrients

Awareness about foods and nutrients among the SHG women of the two blocks is given in Table XVII.

TABLE - XVII

AWARENESS ABOUT FOODS AND NUTRIENTS

Details*	Number	Per cent
Protein rich foods	159	16
Energy yielding foods	141	14
Carbohydrate rich foods	152	15
Fat containing foods	160	16
Vitamin A rich foods	152	15
Vitamin B rich foods	79	8
Vitamin C rich foods	56	5
Calcium rich foods	56	5
Iron rich foods	65	6

* - Multiple response

It is observed that 16 per cent of the women pointed out correctly the protein rich foods. It is found out that 14 per cent of women indicated the correct energy yielding foods like cereals and pulses. Carbohydrate and fat rich foods were correctly pointed out by 15 and 16 per cent of the women respectively. Awareness about foods rich in vitamin A was found to be less (15%), similarly awareness about vitamin B and Vitamin C rich foods were also found to be 8 and 5 per cent among the selected SHG women.

It is heartening to note that among the women a majority of them were not aware of the foods rich in minerals like calcium and iron, which are very much essential for the health of the adult women. Awareness about these nutrients are the need of the hour in order to correct the deficiencies related to bone, blood etc.

c. Food Beliefs and Taboos

Table XVIII gives the details about the food fads and taboos mentioned by the selected SHG women.

TABLE – XVIII

FOOD FADS AND TABOOS AMONG THE SELECTED SHG WOMEN

Details*	Periyanaickenpalayam Block		Karamadai Block		Total	
	N	%	N	%	N	%
Hot foods						
Papaya	180	35	245	47	425	41
Raw rice	80	16	55	11	135	13
Jaggery	75	15	55	11	130	13
Chicken	65	13	25	5	90	9
Mango	25	5	35	7	60	6
Cold foods						
Curds	145	28	125	24	270	26
Ice cream	120	24	115	22	235	23
Fruits	85	17	65	13	150	15
Onion	75	15	70	13	145	14
Gas producing foods						
Potato	360	71	305	59	665	65
Raw plantain	65	13	95	18	160	16
Drumstick	45	9	40	8	85	8
Dhal	25	5	15	3	40	4
Bile producing foods						
Tea	235	46	260	50	495	48
Coffee	175	35	120	24	295	30
Groundnut	20	4	40	8	60	6
Foods increasing milk secretion						
Dried fish	130	25	155	30	285	28
Garlic	95	19	105	20	200	19
Groundnut	15	3	5	1	20	2
Bittergourd	15	3	20	4	35	3
Foods causing skin disease						
Brinjal	170	33	130	25	300	29
Dried fish	65	13	60	12	125	12
Yam	15	3	10	2	25	2
Egg	15	3	10	2	25	2

* - Multiple response

Hot foods reported by the women included papaya, raw rice, jaggery, mango and non vegetarian foods. Among the hot foods papaya was regarded as hot food by a majority of 41 per cent of the women. These foods were believed to produce more heat in the body leading to chicken pox, fever and jaundice.

Curds, ice cream, fruits and onion were reported to be cold producing foods and were avoided during common cold attack. Nearly 24 per cent of the women from both the areas reported ice cream and curds as cold foods.

Potato was considered to be a gas producing food as reported by a maximum percentage (65%) of women. Other gas producing foods stated by the women included raw plantain, drumstick and dhal of any variety.

A majority of 48 and 30 per cent of the families respectively believed that tea and coffee stimulate bile secretion and cause giddiness.

Dried fish and garlic were reported to be the foods increasing breast milk secretion by a majority of the women.

Certain foods like brinjal, yam, egg and dried fish were reported to cause skin diseases of which brinjal was reported by a majority of 29 per cent of the women studied.

These food fads and taboos may sometimes interfere with the food and nutrient availability among the selected women.

4. Health Problems among the Selected SHG Women

Table XIX gives details of the health problems reported by the selected SHG women.

TABLE - XIX

HEALTH PROBLEMS REPORTED BY THE SELECTED SHG WOMEN

Health problems*	Periyanaickenpalayam block (500)		Karamadai Block (500)		Total N- 1000	
	N	%	N	%	N	%
Anaemia	231	45	195	38	426	41
Dryness of skin	180	35	200	38	380	37
Loss of appetite	180	35	195	38	375	36
Joint pain	180	35	184	35	364	35
Easily infected	120	24	163	31	283	27
Constipation	110	22	112	22	222	22
Vision Problem	95	19	103	20	198	19
Depression	98	19	102	20	200	19
Difficulty in breathing	26	5	32	6	58	6
Diarrhoea	23	5	26	5	49	5
Blood pressure	23	5	26	5	49	5
Ulcer	18	4	20	4	38	4

* - Multiple response

It is evident from the findings of the present study that a majority of 41per cent of the women reported anaemia prevalence, 37 per cent of the women had dryness of skin, 36 per cent of the women had loss of appetite and 35 per cent of the women were suffering from joint pain. Among them 27 per cent of the women reported that they were easily infected, 22 per cent of the women had constipation problems and 19 per cent of the women were experiencing depression. Vision problems were present among 19 per cent of the selected women. Lesser percentage of the women expressed health problems like ulcer (4%), diarrhoea (5%), difficulty in breathing (6%) and blood pressure (5%). In general, many of the SHG women reported some or other health problems.

5. Details regarding the Participation of Women in Self Help Groups

Details regarding the SHG included length of membership, reasons for joining, number of members in a group, savings and loan use strategies and benefits received from the Self Help Groups are presented in the following paragraphs.

a. Block wise details of Self Help Groups in Coimbatore District as on July 2010.

Table XX gives the details of the Self Help groups formed in Periyanaickenpalayam and Karamadai blocks of Coimbatore District.

TABLE - XX

BLOCK WISE DETAILS OF THE SELF HELP GROUP WOMEN

Name of the Block	Number of Panchayat villages	Total number of groups formed	Total women covered
Periyanaickenpalayam	9	595	8486
Karamadai	17	1044	14844
Total	**26**	**1639**	**23330**

There are 5,56, 311 SHGs with 85,69,676 members in Tamil Nadu as on 30.09.2012. In Coimbatore district 19,236 SHG groups were formed as on 31.03.2012 with 2,95,754 members (TCDW, 2013). Out of which 1044 groups are in Karamadai Block among the 17 Panchayt villages and 595 groups are in Periyanaikenpalyam Block among the 9 panchayat villages (Saravanakumar and Mamta, 2012). Among the total number of 23330 SHG women, 1000 were selected from 200 groups from the two blocks for the present study.

b. Duration of Membership by the Selected SHG Women

Table XXI, Figure 6 and 7 shows the duration of the membership of the SHG women selected for the study.

TABLE - XXI

DURATION OF MEMBERSHIP OF THE SELECTED SHG WOMEN

Duration of membership	Periyanaickenpalayam Block		Karamadai Block		Total	
	N	%	N	%	N	%
0-6 months	50	10	60	12	110	11
6 months to 1 year	121	24	117	23	238	24
1-2 years	210	42	180	36	390	39
2-3 years	64	13	70	14	134	13
3-4 years	40	8	48	10	88	9
>4 years	15	3	25	5	40	4
Total	**500**	**100**	**500**	**100**	**1000**	**100**

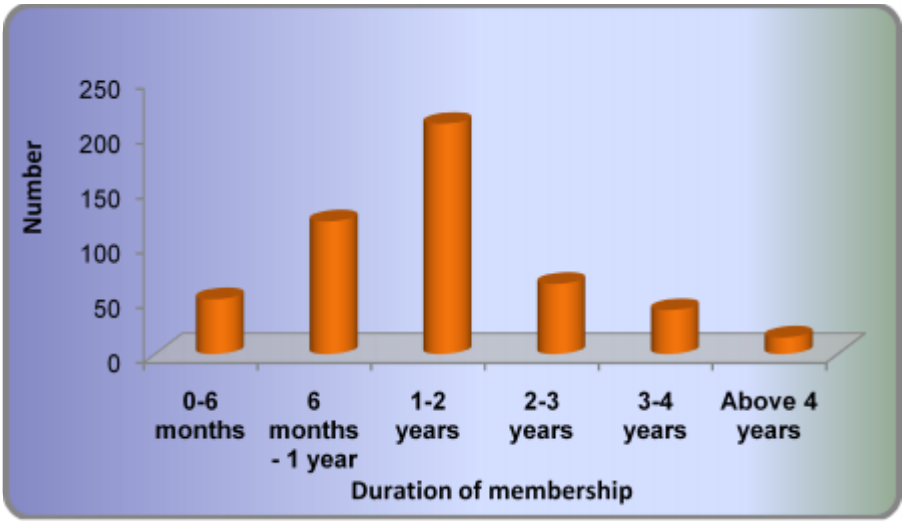

FIGURE 6 – DURATION OF MEMBERSHIP OF THE SELECTED SHG WOMEN IN PERIYANAICKENPALAYAM BLOCK

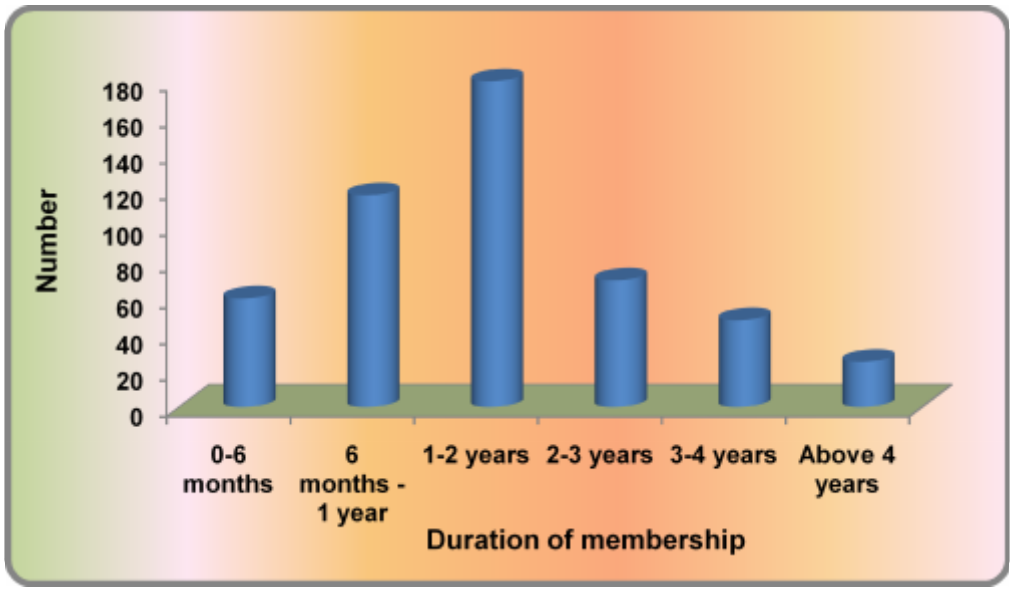

FIGURE 7 – DURATION OF MEMBERSHIP OF THE SELECTED SHG WOMEN IN KARAMADAI BLOCK

From the table it is noticed that the duration of membership of women affiliated to SHG in Periyanaickenpalyam and Karamadai Block ranged from6 months to more than 4 years. A majority of 39 per cent of the women were registered for 1-2 years, followed by 24 per cent from 6 months to one year. Nearly 13 per cent of the women were affiliated for 2-3 years, 9 per cent were for 3-4 years and only 4 per cent of the women were in the group for more than 4 years.

c. Reasons for Joining Self Help Groups

The reasons stated by the selected Self Help Group women for joining the Self Help Groups are given in Table XXII.

TABLE - XXII

REASONS FOR JOINING SELF HELP GROUPS

(N=1000)

Reasons*	N	%
To avail loan facilities and to start a small business	659	66
To develop the habit of savings	464	46
To fulfill their basic needs	144	14
To get economic independence	103	10
To spend their leisure time	82	8
To involve in community activities	52	5

* Multiple response

A majority of 66 per cent of the women joined the SHG with an idea to avail themselves of loan and to start some business. The other reasons expressed were to develop the habit of savings (46%), to fulfill their basic needs (14%), to get economic independence(10%), to spend their leisure time (8%) and to involve in community activities (5%). Majority of the women expressed that for improving their standard of living they joined SHGs. A study conducted by Thangamani and Muthuselvi (2013) reported that most of the respondents (39%) were joining SHGs for saving purpose.

d. Details of Savings

In each SHG groups each member of a group contributes an amount based on their willingness and financial status and created a common fund on regular basis and it was managed by a leader in a democratic way. Depending upon the need of the members, the loans were given on priority basis from the common fund and interests were collected on a nominal basis.

The details of savings by the selected Self Help Groups are given in Table XXIII and Figure 8.

TABLE - XXIII

AMOUNT SAVED BY SELF HELP GROUPS

Annual savings	Self Help Groups (200)	
	N	%
Rs. 5000-10,000	86	43
Rs. 10,001 – 15,000	106	53
Above Rs. 15,001	8	4
Total	**200**	**100**

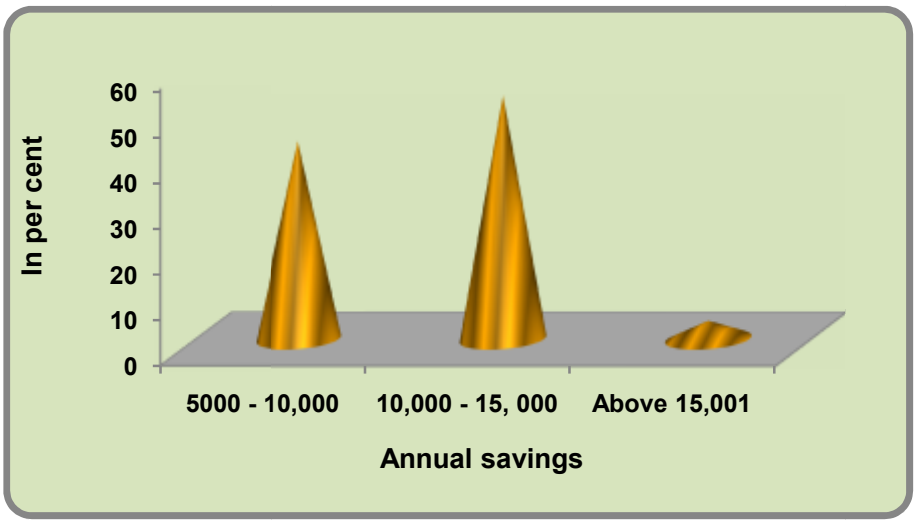

FIGURE 8 – ANNUAL SAVINGS OF THE SELECTED SHG WOMEN

It is clear from the table that a majority of 53 per cent of the groups saved Rs. 10,001 to Rs. 15,000 per annum, followed by 43 per cent of groups saved Rs. 5000 to 10,000. Only 4 per cent of the groups saved more than Rs. 15,001 per annum. All the groups have saved their money through nationalized banks.

e. Benefits Attained after Joining SHG

The benefits attained by the selected SHG women after joining SHG is given in Table XXIV.

TABLE XXIV

BENEFITS ATTAINED AFTER JOINING SHG

(N= 1000)

Benefits*	Periyanaicken palayam block		Karamadai block		Total	
	N	%	N	%	N	%
Getting financial help	246	49	305	61	551	55
Availing loan	240	48	254	51	494	49
Saving habit	105	21	95	19	200	20
Social interaction	80	16	45	9	125	13
Self Confidence	45	9	38	8	83	8
Participating in marketing exhibition	20	4	25	5	45	5
Personality Change	25	5	20	4	45	5
Meeting bank officials	10	2	15	3	25	3
Improvement in their health status	15	3	10	2	25	3
Acquired marketing skills	10	2	5	1	15	2

* - Multiple response

Participation in SHG had created many benefits among the members. About 55 per cent of them had the opportunity to fulfill their financial need at the time of emergency in the families. About 49 per cent of the women revealed that the SHG helped them to avail themselves of loan easily. The other benefits stated by the SHG women included development of saving habit (20%), social interaction (13%) and to develop self confidence (8%). Other benefits expressed included participation in marketing exhibition, improvement in their health status, meeting bank officials and acquiring marketing skills by a lesser percentage of women. From the survey it is found that a majority of SHG women reported that getting financial help is the foremost benefit they obtained by joining Self Help Groups.

B. Health and Nutritional Status of the Self Help Group Women

1. Anthropometric Measurements of the Selected Self Help Group Women

a. Height and Weight of the Selected SHG Women

The mean height and weight of the SHG Women in comparison with ICMR (2010) standard is presented in Table XXV.

TABLE - XXV

MEAN HEIGHT AND WEIGHT OF THE SELECTED SHG WOMEN

(N=1000)

Parameters	ICMR (2010)	Mean±SD	Percentage of Deficit/Excess
Height (cm)	161	160.21± 6.14	-0.5
Weight (Kg)	56	70.2± 8.43	+25.4

The mean height of the SHG women was found to be 160.21 cm which was slightly less than the height of the Indian women suggested by ICMR (2010), the percentage deficit was only 0.5. The mean weight of the SHG women was found to be 70.2 kg which was greater than that of 56 kg suggested by ICMR (2010) and the percentage excess was found to be 25.4 per cent. The findings indicate that the selected SHG women were found to be obese, whereas height was found to be satisfactory. Improper lifestyle with inadequate physical activity might be the reasons for obesity among the selected SHG women. The overall prevalence of Generalized Obesity and Abdominal Obesity was found to be 28.4 per cent and 32.3 per cent among women in Tamil Nadu. The risk factors associated with this obesity includes gender, hypertension, diabetes and physical inactivity (Pradeepa et al., 2015).

b. Body Mass Index of the Selected SHG Women

The Body Mass Index of the SHG women categorized according to WHO (2011) norms is given in Table XXVI and Figure 9.

TABLE - XXVI

BODY MASS INDEX OF THE SELECTED SHG WOMEN

(N= 1000)

Classification	BMI Class*	Number	%
Underweight	<18.50	20	2
Normal range	18.50 – 24.99	180	18
Pre-obese	25.00 – 29.99	330	33
Obese class I	30.00 – 34.99	250	25
Obese class II	35.00 – 39.99	170	17
Obese class III	≥40.00	50	5
	Total	1000	100

* WHO (2011)

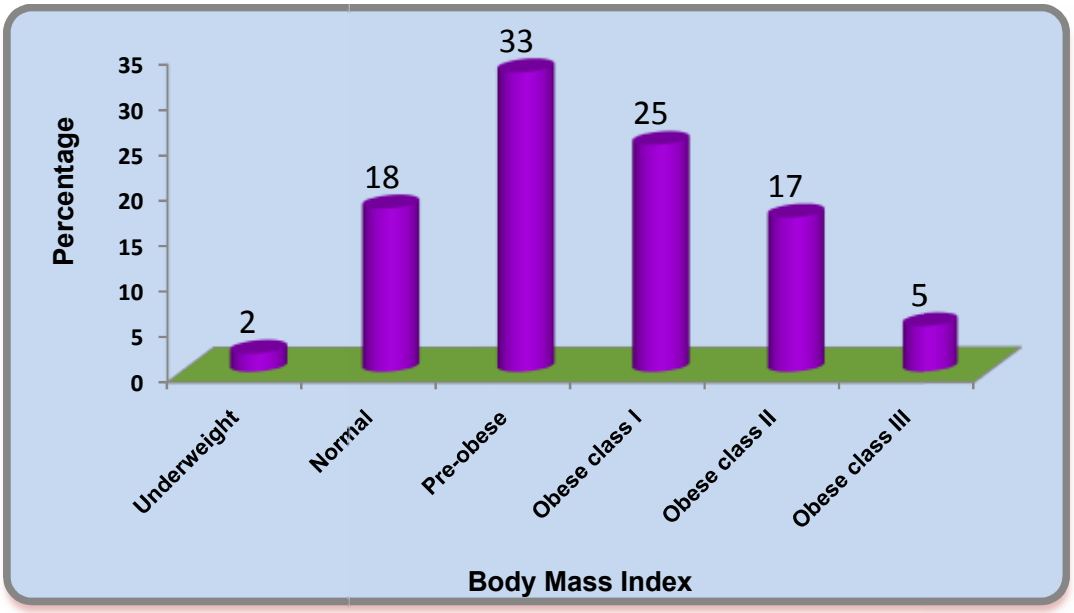

FIGURE 9 – BODY MASS INDEX OF THE SELECTED SHG WOMEN

Body Mass Index is a most effectively used indicator to describe the magnitude of nutritional status of the population (Ismail *et al.,*1995). The present

study revealed a highest prevalence of pre obesity based on BMI classification to be 33 per cent. The prevalence of obese class I, obese class II and obese class III were found to be 25,17 and 5 per cent respectively and have a total of 47 per cent of women. Nearly 50 per cent of the women under study were found to be in the obese category, which is an alarming observation. There were only 2 per cent of women in the underweight category and only 18 per cent of women were in the normal BMI class. According to the National Family Health Survey (NFHS- 3, 2005 – 2006), the percentage of married women aged 15-49 years who are overweight or obese increased from 11 per cent in NFHS – 2 to 15 per cent in NFHS -3.

Based on the study conducted by Mathanghi *et al.* (2013) reported that 24 per cent of the women were in the 18.5 to 22.5 BMI range and 6 per cent of the women were in the above 30 BMI category. This finding highlights the need for proper nutrition education among the SHG women in order to reduce the prevalence of obesity, increase physical activity and reduce the intake of high calorie foods to lead a healthy life.

c. Waist to Hip Ratio (WHR) of the Selected SHG Women

The Waist to Hip Ratio of the selected SHG women is given in Table XXVII and Figure 10.

TABLE - XXVII

WAIST TO HIP RATIO OF THE SHG WOMEN

(N=1000)

Waist to Hip ratio*	No	Per cent
Normal (≤0.8)	232	23
Moderate (0.81 – 0.85)	341	34
High (>0.85)	427	43
Total	1000	100

* WHO (2009)

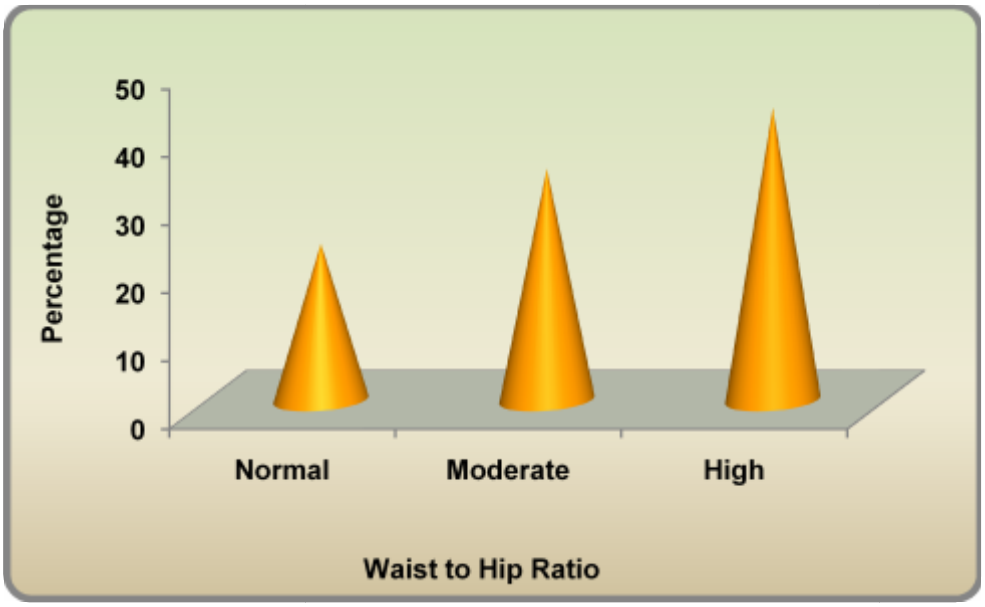

FIGURE 10 – WAIST TO HIP RATIO OF THE SELECTED SHG WOMEN

In the present study a majority of 43 per cent of the SHG women had more than 0.8 WHR which is very crucial and coincides with the state of obesity among the SHG women. About 34 per cent of the women were at the moderate risk category with 0.81 to 0.85 WHR and only 23 per cent of the women had a normal WHR of 0.8. A study conducted by Prakruthi and Jamuna Prakash (2013) showed that obese women were in the age range of 35+ years with a very high WHR of 0.82.

2. Clinical Examination of the Selected Self Help Group Women

Clinical signs and symptoms found among the SHG women as screened by the medical practitioner is presented in Table XXVIII.

TABLE - XXVIII

CLINICAL SIGNS AND SYMPTOMS OF NUTRITIONAL DEFICIENCY AMONG THE SHG WOMEN

(N= 1000)

Clinical signs*	No	Percentage of prevalence
Healthy and free from diseases	412	41
Hair		
Brittle	122	12
Lusterless	82	8
Discoloured	39	4
Ocular manifestations		
Conjuctival xerosis	201	20
Dim vision	156	16
Bitot's spot	52	5
Teeth		
Fluorosis	2	0.2
Chalky	42	4
Mottled and discoloured enamel	103	10
Gums		
Bleeding gums	424	42
Tongue		
Paleness	232	23
Skin		
Rashes	54	5
Roughness	152	15
Allergy	42	4
Boils	27	3

Clinical signs*	No	Percentage of prevalence
Face		
Paleness	442	44
Dryness	425	43
Nails		
Brittle nails	347	35
White spots on nails	189	19
Thyroid gland		
Enlargement	30	3
Subcutaneous tissue		
General oedema	556	56
Joint pain	600	60
Muscle pain	280	28
Internal system		
Gastrointestinal		
Improper digestion	284	28
Stomach pain	161	16
Worm infestation	252	25
Nervous system		
Sleep disturbances	402	40
Mental confusion	214	21
Calf tenderness	404	40
Restlessness	503	50

* Multiple response

It is evident from the findings of the present study that 41 per cent of the SHG women had good nutritional status without any clinical signs and symptoms. Twenty four per cent of the SHG women had poor hair conditions like brittle,

lusterless and discolored hair. Conjuctival Xerosis, which is a well known ocular manifestation of vitamin A deficiency, was seen among 20 per cent of the SHG women. Sixteen per cent of the SHG women had dim vision and only 5 per cent of the women was affected with Bitot's spot. Symptoms like fluorosis, chalky teeth, mottled and discoloured enamel were seen among a lesser percentage of women, bleeding gums and paleness of tongue were found among 42 and 23 per cent of the women respectively being the highest.

Other clinical symptoms like skin rashes, allergy and boils were found among a lesser percentage of women whereas roughness of skin was more among 15 per cent of women. Paleness and dryness of face was common among 44 and 43 per cent of women respectively. Brittle nails and white spots on finger nails were also found among the women. The changes in skin and hair can provide clues to the presence of underlying vitamin deficiency. Enlargement of thyroid was found among 3 per cent of the SHG women.

General edema and joint pain were reported by 56 and 60 per cent of women respectively followed by muscle pain among 28 per cent of SHG women. Gastrointestinal problems like improper digestion, ulcer and worm infestation were also found among SHG women. Restlessness was found among 50 per cent of the SHG women, followed by sleep disturbances (40%), calf tenderness (40%) and mental confusion (21%).

Examination of the clinical signs and symptoms among majority of the women revealed that they were leading an unhealthy life due to lack of some important micronutrients in their diet. Hence supplementation of nutritious mixes along with nutrition education is very important for promoting healthy living among the SHG women.

3. Biochemical Parameters of the Selected SHG Women

a. Blood Haemoglobin levels

Table XXIX and Figure 11 present the details regarding the blood haemoglobin levels and anaemia prevalence among the SHG women.

TABLE - XXIX

HAEMOGLOBIN LEVELS OF THE SELECTED SHG WOMEN

(N =1000)

Anaemic status	Hb levels* (g per dl)	Number	Percent
Normal	≥ 12	122	12
Mild	10-11.9	205	21
Moderate	7-9.9	651	65
Severe	< 7	22	2
Total		**1000**	**100**
Mean Hb level of SHG women			9.87±1.35

* WHO (2011)

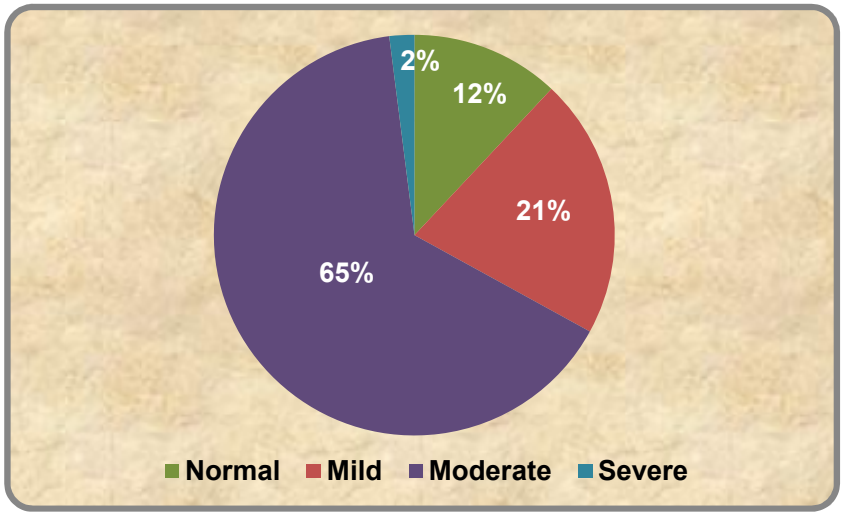

FIGURE 11 – ANAEMIC STATUS OF THE SELECTED SHG WOMEN

Haemoglobin level is the most commonly used indicator to detect anaemia at the field level(WHO, 2011). A majority of 65 per cent of the SHG women were having haemoglobin levels in the range of 7 to 9.9 g/dl indicating moderate anaemic status.

Only 12 per cent of the SHG women had normal haemoglobin levels of more than 12 g/dl. Mild anaemia with haemoglobin levels of 10 to 11.9 g/dl was found among 21 per cent of women and severe anaemia was found among 2 per

cent of women having less than 7g/dl. The mean haemoglobin level of all the 1000 SHG women was found to be 9.87g/dl which reveals the higher prevalence of moderate anaemic status. Anaemia may interfere with their regular activities. This may be due to inadequate intake of iron rich green leafy vegetables and fruits in their dietaries.

b. **Percentage Distribution of Women According to their Serum Iron and Serum Calcium Levels**

Table XXX, Figure 12 and 13 gives the serum iron and serum calcium levels of the selected subsample of SHG women in comparison with the reference values.

TABLE - XXX

MEAN SERUM IRON AND SERUM CALCIUM LEVELS OF THE SELECTED SHG WOMEN

Parameters	N	%
Mean Serum iron (mcg/dl)		
30-40 mcg/dl	34	30
40-50 mcg/dl	65	58
50- 170 mcg/dl (Normal)*	13	12
Total	**112**	**100**
Serum Calcium(mg/dl)**		
Very low (7.0- 8.0)	11	8
Low (8.0 – 9.0)	92	64
Normal (9.0 – 10.6)	30	21
High (10.6 – 11.0)	10	7
Total	**143**	**100**

* Tiez (1976), ** Institute of Medicine (2010)

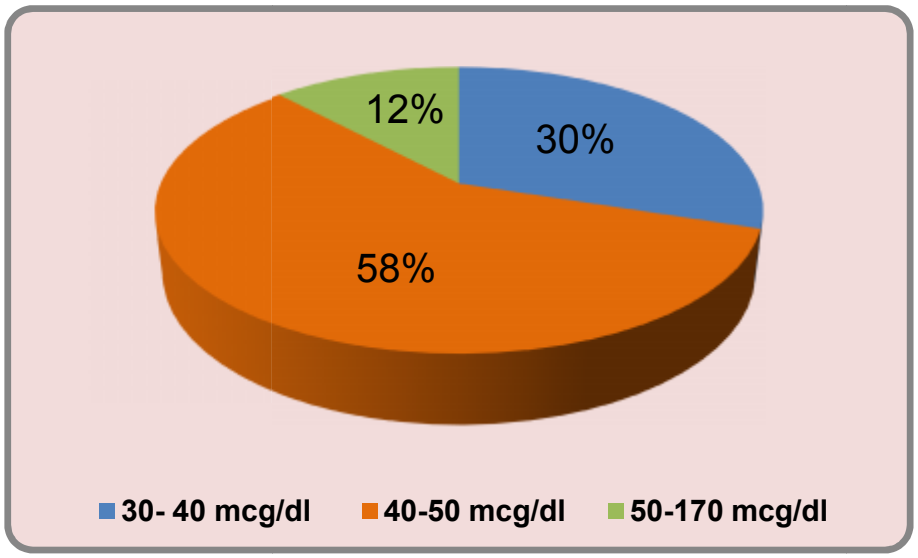

FIGURE 12 – SERUM IRON LEVEL OF THE SELECTED SHG WOMEN

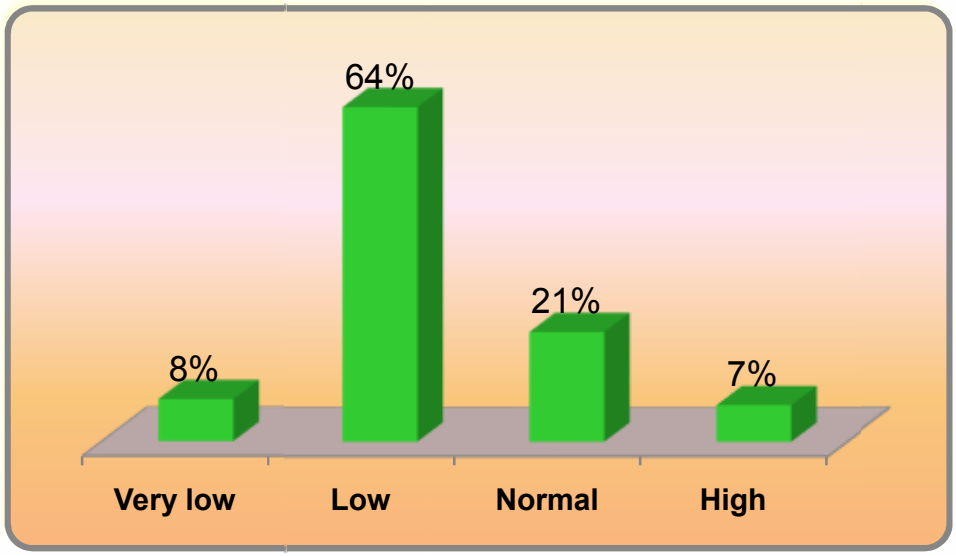

FIGURE 13 – SERUM CALCIUM LEVEL OF THE SELECTED SHG WOMEN

Findings of the study revealed that 12 per cent of the women under survey had normal serum iron levels whereas a majority of 58 per cent women had serum iron levels below the reference values. This observation correlates with the higher prevalence of moderate anaemia and clinical symptoms of paleness of tongue and face and brittle nails among the selected SHG women.

With regard to serum calcium levels 21 per cent of the women had normal serum calcium levels of 9.0 to 10.6 mg/dl. Sixty four per cent of the SHG women had low serum calcium levels of 8.0 to 9.0 mg/dl. About 8 per cent of the women had very low serum calcium levels of 7.0 to 8.0 mg/dl. This study revealed that nearly one half of the women studied had very low serum iron and calcium levels. Inadequate intake of foods rich in calcium and iron might be the cause for these low levels.

4. Food and Nutrient intake of the Selected Self Help Group Women

a. Food Intake

The mean food intake per day found out by recall method by the SHG women (12%) in comparison with ICMR (2010) Recommended Allowances is given in Table XXXI and Figure 14.

TABLE - XXXI

MEAN FOOD INTAKE OF THE SELECTED SHG WOMEN

(N=120)

Foods	Suggested Intake(g) (ICMR,2010)	Actual Intake (g)	Percentage deficit/excess
Cereals and millets	330	310	-6
Pulses	45	47	+4
Leafy vegetables	100	50	- 50
Other vegetables	200	75	-63
Roots and Tubers	200	80	-60
Fruits	100	60	-40
Milk and Milk products	300	200	-33
Fats and oil	25	30	+20
Sugar and jaggery	30	22	-27
Non vegetarian foods	30	21	-30

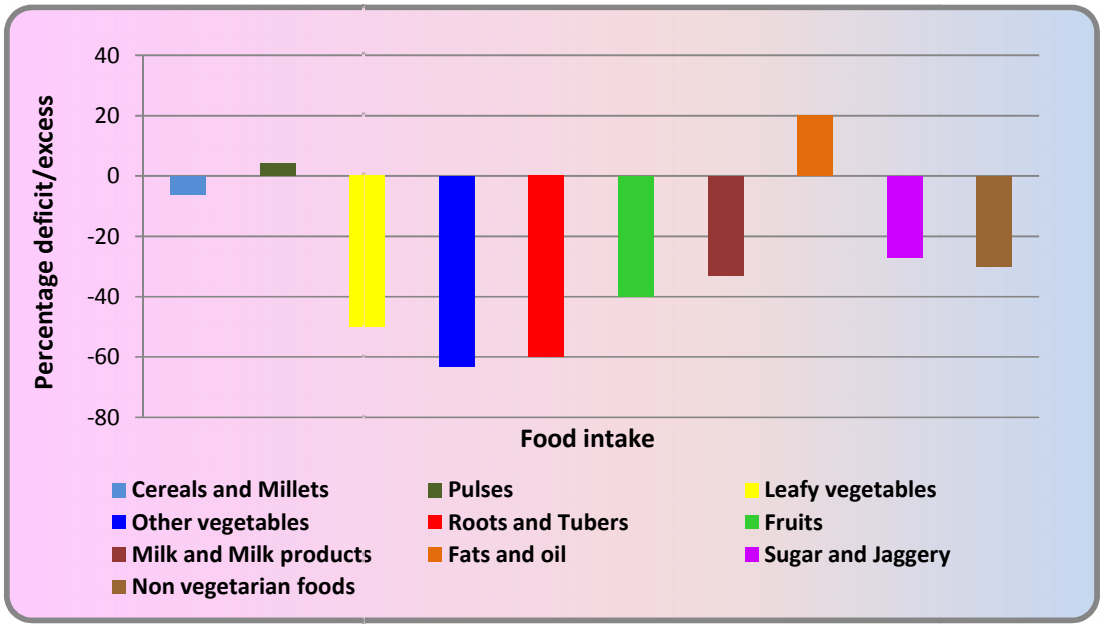

FIGURE 14 – MEAN FOOD INTAKE OF THE SELECTED SHG WOMEN

The intake of cereals was found to be deficit by 6 per cent but pulse intake was excess by 4 per cent among the SHG women. The intake of leafy vegetables, other vegetables, roots and tubers, fruits and milk and milk products was found to be deficit by 50, 63,60, 40 and 33 per cent respectively. Fat intake was found to be excess by 20 per cent. It is also observed that consumption of sugar and jaggery was found to be deficit by 27 per cent, a welcome observation. Majority of the women were non vegetarians but their intake was once a week or occasionally and found to be deficit by 30 per cent. In general consumption of foods rich in micronutrients like green leafy vegetables, other vegetables, fruits and milk and milk products was inadequate predisposing them to micronutrient deficiencies.

b. Nutrient Intake

The mean nutrient intake of the selected SHG women compared with ICMR Recommended Allowances (2010) is given in Table XXXII and Figure 15.

TABLE - XXXII

MEAN NUTRIENT INTAKE OF THE SELECTED SHG WOMEN

(N=120)

Nutrients	Suggested Intake (ICMR,2010) (Moderate activity)	Actual Intake (g)	Percentage Deficit/excess
Energy (kcal)	2230	2010	-10
Protein (g)	55	53	-4
Calcium (mg)	600	200	-67
Iron (mg)	21	10	-52
Beta carotene (mcg)	4800	1000	-79
Thiamine (mg)	1.1	1.6	+31
Riboflavin (mg)	1.3	1.8	+38
Niacin (mg)	14	16	+14
Vitamin C (mg)	40	22	-45
Folic acid (mcg)	200	96	-52

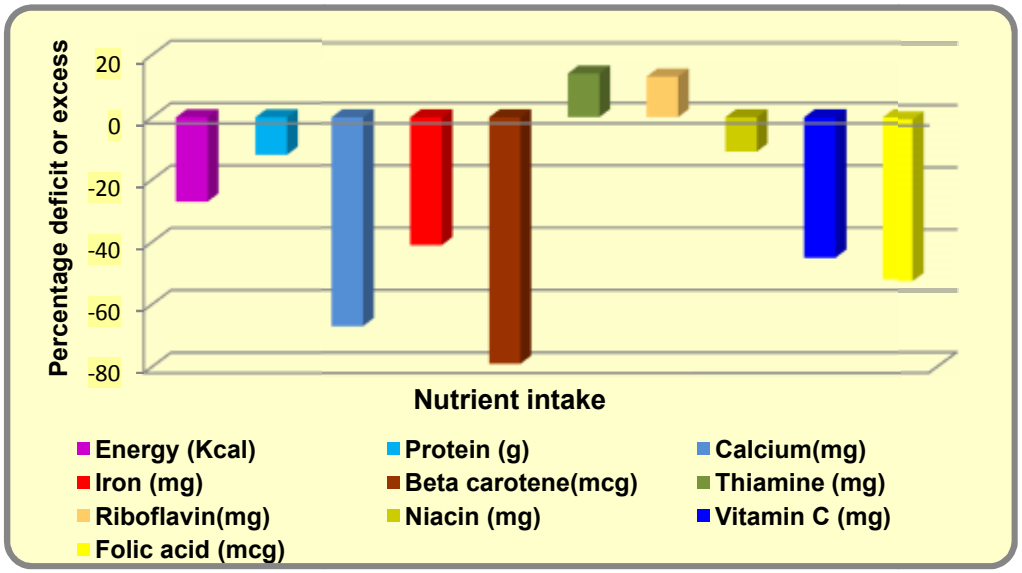

FIGURE 15 – MEAN NUTRIENT INTAKE OF THE SELECTED SHG WOMEN

Energy intake was found to be inadequate by 10 per cent and protein by 4 per cent among the selected SHG women. It is observed that the intake of calcium, beta carotene, folic acid, vitamin C and iron were found to be highly deficient ranging from 45 to 79 per cent which might be the reason for the higher

prevalence of moderate anaemia among the SHG women. Thiamine and Riboflavin intake was found to be excess of Recommended Allowances. Inadequate intake of leafy and other vegetables, fruits, milk and milk products might have brought deficiencies in these nutrients. In general, the intake was found to be deficient invariably for all the nutrients except thiamine and riboflavin. This was mainly because the diets were not balanced, to meet the needs of all the nutrients. According to the study findings conducted by Rao *et al.* (2010) among the rural Indian women more than 70 per cent of the women were not meeting even 50 per cent of the requirement for iron and vitamin A.

Supplementation of micronutrient rich foods is the need of the hour in order to correct the nutrient inadequacies of the women. Hence supplementation was planned with low cost locally available foods like drumstick leaves, araikeearai, roasted bengal gram, ragi and jaggery selected due to their high content of calcium, iron, beta carotene and protein.

C. Details of Nutritional Interventions – Supplementation of Nutritious Mixes

1. Acceptability Scores of the Formulated Nutritious Mixes

The mean scores obtained for Basic nutri mix, araikeerai and drumstick leaves powder incorporated nutritious mixes as judged by the panel members are presented in Table XXXIII and Figure 16.

TABLE - XXXIII

MEAN ACCEPTABILITY SCORES OF THE NUTRITIOUS MIXES

Quality	Maximum score	Basic nutri mix	Nutri mix I	Nutri mix II
Colour	9	8.0	7.6	8.0
Appearance	9	8.0	7.3	7.0
Flavour	9	7.0	7.6	7.0
Texture	9	7.9	7.3	6.9
Taste	9	8.2	7.7	7.1
Total	45	39.1	37.5	36

Nutri mix I – Shade dried Araikeerai leaves powder incorporated

Nutri mix II – Shade dried Drumstick leaves powder incorporated

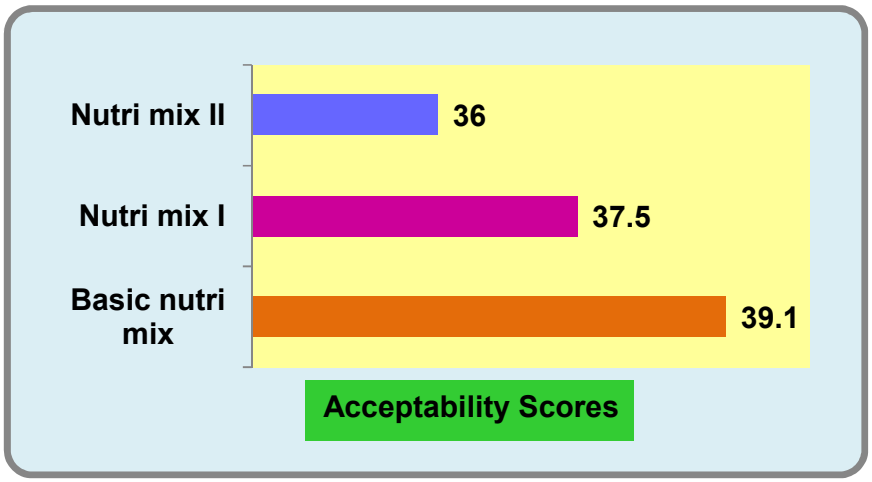

FIGURE 16 – MEAN ACCEPTABILITY SCORES OF THE FORMULATED NUTRITIOUS MIXES

Acceptability tests were carried out by a panel of 25 semi trained members using a 9 point hedonic scale score card.

Basic nutri mix and nutri mix II obtained the maximum score for colour followed by nutri mix I with 7.6 score.

With regard to appearance, basic nutri mix got the maximum score of 8.0, followed by 7.3 for nutri mix I and 7 for nutri mix II.

For flavour, nutri mix I obtained the highest score of 7.6 followed by 7.0 for nutri mix II and basic nutri mix.

With regard to texture, a maximum score of 7.9 was obtained by basic nutri mix. Nutri mix I got the highest score of 7.3 compared to nutri mix II with 6.9 score.

For taste, basic mix got the highest score of 8.2, whereas nutri mix 1 got the score of 7.7 when compared to nutri mix II with the score of 7.1.

In general, all the formulations were evaluated to be good by the taste panel members and none of the formulations got very poor scores. In particular basic mix I was found to be highly acceptable followed by nutri mix I and II which were having shade dried araikeerai leaves powder and shade dried drumstick leaves powder respectively.

2. Nutrient Content of the Formulated Nutritious Mixes

a. Proximate Principles

The proximate principles of the formulated nutri mixes are presented in Table XXXIV.

TABLE - XXXIV

PROXIMATE PRINCIPLES OF THE FORMULATED NUTRI MIXES

(In 100g)

Proximate principles	Basic nutri mix	Nutri mix I	Nutri mix II
Energy (kcal)	395	410	422
Carbohydrate (g)	60.2	63.80	63.57
Protein (g)	11.3	13.17	12.57
Fat(g)	5.8	5.9	6.1
Moisture (g)	1.9	2.1	2.3
Fibre (g)	1.6	2.0	2.3

Nutri mix I – Shade dried Araikeerai leaves powder incorporated

Nutri mix II – Shade dried Drumstick leaves powder incorporated

From the table it is observed that nutri mix II had a highest energy content of 422 kcal, followed by nutri mix I with 410kcal and basic nutri mix with an energy content of 395 kcal per 100g. The carbohydrate content of nutri mix I and II was found to be 63.80 g and 63.57 g respectively, whereas basic nutri mix had only 60.2 g of carbohydrate per 100 g. Carbohydrate content was found to be more among nutri mix I than nutri mix II and basic nutri mix.

The protein content of the basic nutri mix, nutri mix I and II ranged from 11.3 to 13.17 with a highest amount for nutri mix I with 13.17g and Nutri mix II with 12.57g per 100g. Fat content of the mixes showed that nutri mix II was found to have more fat 6.1 g compared to nutri mix I with 5.9 g and basic nutri mix with 5.8g per 100g. Moisture content of the formulated nutri mixes were found to be less ranging from 1.9 to 2.3 g per cent and this low moisture content might be the

contributing factor for good keeping quality of these nutri mixes. The fibre content of the mixes was found to be high in nutri mix II with 2.3 g per 100g followed by nutri mix I with 2.0 g and basic nutri mix with 1.6 g. The high fibre content of nutri mix I and II might be due to the Araikeerai and drumstick leaves powder incorporation.

b. Mineral Content

The mineral content of the formulated nutri mixes is presented in Table XXXV.

TABLE - XXXV

MINERAL CONTENT OF THE FORMULATED NUTRI MIXES

(In 100g)

Minerals	Basic nutri mix	Nutri mix I	Nutri mix II
Calcium (mg)	208	354	457
Phosphorus (mg)	241	282	287
Iron (mg)	4.9	8.5	6.2

Nutri mix I – Shade dried Araikeerai leaves powder incorporated

Nutri mix II – Shade dried Drumstick leaves powder incorporated

Calcium content of the nutri mix II (drumstick leaves incorporated) was found to be high with 457 mg per 100g , followed by nutri mix I (araikeerai leaves incorporated) with 354 mg and basic nutri mix with 208 mg per 100g. Calcium content of the drumstick leaves powder prepared by drying was found to be 86-87 per cent higher than the fresh leaves (Joshi and Mehta, 2010).

With regard to phosphorus content nutri mix II had 287 mg per 100g slightly higher than basic mix and nutri mix II which had 241 and 282 mg per 100g respectively. Phosphorus plays an important role in the utilization of the calcium in our daily diet, since the calcium which we take through our diet is deposited as calcium phosphate in the skeletal system of our body. Phosphorus content of shade dried drumstick leaves was found to be 280mg/100g (Lakshmi and Kohila, 2007).

Among the three mixes, the nutri mix II incorporated with drumstick leaves was found to be high in calcium and phosphorus content and hence it was supplemented for the women with low serum calcium content.

Araikeerai leaves incorporated nutri mix I had a high amount of 8.5 mg per 100g of iron, whereas drumstick leaves incorporated nutri mix II had 6.2 mg per 100g followed by basic nutri mix with 4.9 mg per 100g of iron. The iron content of shade dried Araikeerai leaf powder was 267mg/100g (Kowsalya and Vidhya, 2004). This iron content was able to meet one third of iron requirement for the women and hence it was selected for the supplementation of women with low haemoglobin and serum iron.

c. Vitamin Content

Table XXXVI presents the vitamin content in 100g of the formulated nutri mixes.

TABLE - XXXVI

VITAMIN CONTENT OF THE FORMULATED NUTRI MIXES

(In 100g)

Vitamins	Basic nutri mix	Nutri mix I	Nutri mix II
Total carotene (mcg)	122	3032	3902
Beta carotene (mcg)	70	2432	3012
Vitamin C (mg)	ND	ND	ND
Thiamine (mg)	0.2	0.21	0.19
Riboflavin (mg)	0.1	0.14	0.13
Niacin (mg)	2.7	2.8	2.9

ND – Not Detected

Nutri mix I – Shade dried Araikeerai leaves powder incorporated

Nutri mix II – Shade dried Drumstick leaves powder incorporated

A highest total carotene was observed in Nutri mix II with 3902mcg, followed by Nutri mix I with 3032 mcg which had Araikeerai leaves powder incorporation.

With regard to beta carotene also nutri mix II was found to have more amount with 3012mcg, when compared to nutri mix I with 2432mcg. In both the nutri mixes I and II, total and beta carotene content was found to be high, which is due to the incorporation of shade dried GLV in the mixes, when compared to basic nutri mix, which did not have any leafy vegetable powder incorporation.

Ascorbic acid is low and may be lost due to the oxidation while drying the GLV and hence it was not in detectable amount. Thiamine content of the mixes ranged from 0.19 to 0.21 mg per 100g with negligible difference between mixes. Riboflavin content ranged from 0.1 to 0.14 mg per 100g again with very little difference between mixes. Niacin content of the mixes ranged from 2.7 to 2.9 mg per 100g revealing similarity of content among the three mixes.

In general, B complex vitamins were found to be present in more or less similar amounts in basic and nutri mix I and II.

3. Anti Nutritional factors in the Formulated Nutritious Mixes

The anti nutritional factors like oxalate, phytate, tannin and alkaloids were estimated for the formulated nutri mixes and presented in Table XXXVII.

TABLE - XXXVII

ANTINUTRITIONAL FACTORS OF THE FORMULATED NUTRI MIXES

(In 100g)

Anti nutritional factors	Basic nutri mix	Nutri mix I	Nutri mix II
Oxalate (mg)	40	49.02	84.04
Phytate(g)	0.34	0.23	0.41
Tannin(g)	0.04	1.75	0.13
Alkaloids (g)	0.9	1.64	1.22

Nutri mix I – Shade dried Araikeerai leaves powder incorporated

Nutri mix II – Shade dried Drumstick leaves powder incorporated

The oxalate content of nutri mix II was found to be high with 84.04 mg followed by nutri mix I with 49.02mg and basic nutri mix with 40mg in 100g. Based on 5 individuals, researchers from Wake Forest University estimated the daily intake of oxalate to be in an average of 152 ± 83 mg, ranging from 44 - 352 mg/day (Holmes and Kennedy, 2000), which were regarded to be safe. The oxalate content of mixes was found to be within safe limits. With regard to phytate, nutrimix II had slightly higher phytate content of 0.41g per 100g compared to nutri mix I with 0.23g and basic mix with 0.34g per 100g. Plant foods-based diets also have high phytate content. Although studies revealed that phytate may have beneficial roles as an antioxidant and anticarcinogen (Jeanb and Thompsonm, 2002), but higher levels may interfere with utilization of calcium and other minerals. The levels found in the mixes are very low and hence within safe levels

With regard to tannin, nutrimix I contained a maximum of 1.75g and basic mix had a minimum of 0.04g per 100g. The use of tannic acid as a feed additive up to 15 mg/kg feed is safe for all animal species (EFSA,2014). In the case of alkaloids, nutri mix I had 1.64g being the highest whereas nutri mix II and basic mix had 1.22g and 0.9g per 100 g respectively.

4. Shelf life of the Formulated Nutritious Mixes

One hundred gram each of the basic nutri mix, nutri mix I and nutri mix II were packed in polythene covers and kept in plastic containers and was subjected to shelf life studies for a period of 60 days. The mixes were analysed for moisture and bacterial contamination at zero days and after sixty days and presented in Table XXXVIII.

Moisture content of nutri mixes at initial period ranged from 1.9 to 2.3g and at the end of 60 days storage ranged from 3.1 to 3.4g per 100g. The results of the moisture content showed that it increased very slightly ranging from 0.8 to 1.5 g per cent during the 60 days storage period revealing good keeping quality especially among nutri mix II and nutri mix I.

TABLE - XXXVIII

SHELF LIFE TESTING OF THE FORMULATED NUTRI MIXES

(In 100g)

Criteria	Basic nutri mix		Nutri mix I		Nutri mix II	
	Initial	After 60 days	Initial	After 60 days	Initial	After 60 days
Moisture (g)	1.9	3.4	2.1	3.2	2.3	3.1
Total bacterial count (cfu/g)	Abs	2000	Abs	3000	Abs	4000
Yeast Count	BDL	BDL	BDL	BDL	BDL	BDL
Mould Count	BDL	BDL	BDL	BDL	BDL	BDL

Nutri mix I – Shade dried Araikeerai leaves powder incorporated

Nutri mix II – Shade dried Drumstick leaves powder incorporated

BDL – Below Detectable Limits Abs - Absent

The total bacterial count of the formulated nutritious mixes was found to be absent at the initial days and after 60 days of storage it increased ranging from 2000 to 4000, which was within safe limits. Yeast and mould count was also found to be below detectable limits in all the nutri mixes both initially and after 60 days of storage. These results prove the fact that the basic mix and nutritious mixes formulated incorporated with shade dried green leafy vegetables could well be stored up to 60 days at home scale level.

5. Cost analysis of the Formulated Nutritious Mixes

Calculation of the cost of the mixes will help us to evaluate the feasibility of the mixes for commercial exploitation. The cost of the formulated nutritious mixes was calculated for 100g by making use of the cost of the raw materials prevalent in the market at the time of the study and presented in Table XXXIX.

TABLE - XXXIX

COST ANALYIS OF THE FORMULATED NUTRITIOUS MIXES

Criteria	Basic nutri mix I	Nutri mix I	Nutri mix II
Raw materials cost (in Rs.)	10.35	15.80	15.20
Processing cost (in Rs.)	0.50	0.50	0.50
Packing cost (in Rs.)	0.30	0.30	0.30
Cost of 100g of the mix	11.15	16.6	16.0
Cost of 30 g of the mix	3.35	5.0	4.8

Nutri mix I – Shade dried Araikeerai leaves powder incorporated

Nutri mix II – Shade dried Drumstick leaves powder incorporated

The cost of araikeerai leaves powder incorporated nutri mix I was Rs. 16.6 /100gms, whereas drumstick leaves incorporated nutri mix II costed Rs. 16/100gms. The cost of basic mix was found to be Rs. 11.15 per 100g being the lowest. Nutri mix I and II costed more because of incorporation of green leafy vegetables powders. Cost of the commercially available health mixes can be ten times higher than the formulated mixes. These formulations are found to be inexpensive and have the advantage of providing more micronutrients in addition to calories and proteins and calcium and iron. This food based formulations can be a best strategy in the alleviation of micronutrient deficiency.

D. Impact of Supplementation of Nutritious Mixes among the SHG Women

1. Anthropometric Measurements of the SHG Women

a. Weight of SHG women

The mean weight of the selected SHG women before and after supplementation of nutritious mixes is shown in Table XL and Figure 17.

TABLE - XL

MEAN WEIGHT OF THE SELECTED SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

Groups	Weight (kg)		Mean difference (kg)	't' value	Groups Compared	't' value
	Before (n=30)	After(n=30)				
E1	62.13± 6.13	60.63±5.47	-1.5	7.64**	E1 vs C1	0.158 NS
C1	61.4± 3.81	61.67±3.68	0.27	2.11NS		
E2	61.2± 4.86	59.6±4.49	-1.6	10.77**	E2 vs C2	0.328 NS
C2	61.1± 3.24	61.37±2.99	0.27	1.05NS		

NS – Not Significant , ** -Significant at 1% level (p<0.01)

EI - Experimental group with anaemia CI - Control group with anaemia

E2 - Experimental group with low calcium levels C2 - Control group with low calcium levels

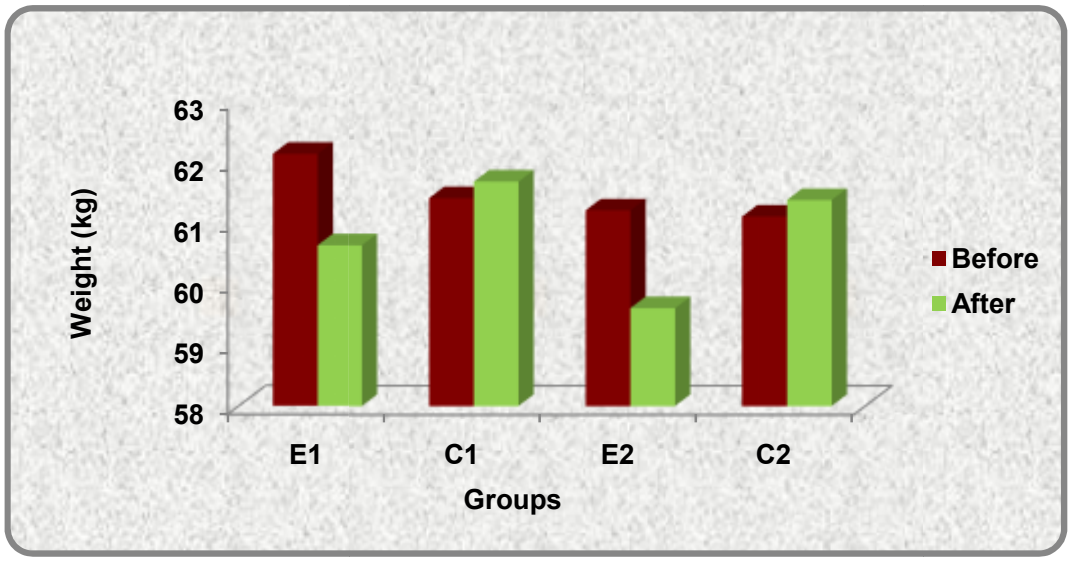

FIGURE 17 – MEAN BODY WEIGHT OF THE SELECTED SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

It is evident from the table that the mean body weight of the selected SHG women in experimental group 1 showed a reduction by 1.5 kg over a period of four months whereas a slight increase of 0.27 kg was seen in control group 1. Experimental group 2 also showed a reduction in their body weight by 1.6kg over a period of four months, but in control group 2 there was a slight increase in body

weight by 0.27kg. In both the experimental groups there was a reduction in their weight due to supplementation compared to control group, where a slight increase in weight was observed. Changes in weight of both experimental and control groups before and after four months supplementation were found to be statistically not significant. Supplementation for a longer period coupled with increased physical activity might bring about reduction in weight among the SHG women..

b. BMI of SHG women

BMI of the selected SHG women before and after supplementation is presented in Table XLI.

TABLE – XLI

MEAN BODY MASS INDEX OF THE SELECTED SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

Groups	BMI		Mean difference	't' value	Groups compared	't' value
	Before (n=30)	After(n=30)				
E1	26.7 ± 3.04	26.06 ± 2.77	-0.64	7.18**	E1 vs C1	6.39**
C1	24.68 ±1.77	24.75 ± 1.65	0.07	1.09^{NS}		
E2	25.01 ± 2.45	24.37 ± 2.39	-0.64	10.99**	E2 vs C2	6.25**
C2	24.65 ± 1.80	24.74 ±1.69	0.09	0.85^{NS}		

NS – Not Significant * *-significant at 1% level (p<0.01)

EI - Experimental group with anaemia CI - Control group with anaemia

E2 - Experimental group with low calcium levels C1 - Control group with low calcium levels

The mean BMI of experimental group I was found to be 26.7 during the initial period, whereas after the supplementation the BMI was slightly reduced to 26.06 with a difference of only 0.64 which was statistically significant at one per cent level. In control group 1 the initial mean BMI was found to be 24.68, but after four months without supplementation the BMI slightly increased to 0.07 which was statistically not significant.

Similarly in experimental group 2 also the mean BMI was found to reduce slightly after the intervention period. The mean BMI of the experimental group 2 was found to be 25.01, whereas after supplementation it was reduced by 0.64 and statistically significant at one per cent level. In control group 2 also the initial mean BMI was 24.65 which was slightly increased by 0.09 after four months with no supplementation which was statistically not significant.

2. Clinical Examination of the SHG Women

Table XLII shows the prevalence of clinical symptoms among the selected SHG women before and after supplementation.

TABLE - XLII

PREVALENCE OF CLINICAL SYMPTOMS AMONG THE SELECTED SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

Clinical signs*	Before (No=120)		After (No=120)		Difference	
	No	%	No	%	No	%
Hair						
Brittle	35	29	33	28	1	1
Lusterless	22	18	20	17	1	1
Discoloured	10	8	10	8	0	0
Ocular manifestations						
Conjuctival xerosis	35	29	34	28	1	1
Dim vision	36	30	35	29	1	1
Bitot's spot	10	8	8	8	2	2
Teeth						
Fluorosis	5	4	5	4	0	0
Chalky	8	7	8	7	0	0
Mottled and discoloured enamel	25	21	23	19	2	2
Gums						
Bleeding gums	110	92	98	82	12	10
Tongue						

Clinical signs*	Before (No=120)		After (No=120)		Difference	
	No	%	No	%	No	%
Paleness of tongue	62	52	56	50	6	5
Skin						
Rashes	12	10	8	7	3	3
Roughness	38	32	34	28	4	3
Allergy	10	8	8	7	1	1
Boils	4	3	4	3	0	0
Face						
Paleness	67	56	60	50	6	5
Dryness	85	71	70	58	15	13
Nails						
Brittle nails	69	58	66	55	3	3
White spots on nails	59	49	48	40	11	9
Thyroid gland						
Enlargement	6	5	5	4	1	1
Subcutaneous tissue						
General oedema	75	63	64	53	11	9
Joint pain	98	82	90	75	8	7
Muscle pain	96	80	88	73	8	7
Internal system						
Gastrointestinal						
Improper digestion	65	54	60	50	5	4
Stomach pain	32	27	29	24	3	3
Worm infestation	26	22	21	18	5	4
Nervous system						
Sleep disturbances	101	84	94	78	7	6
Mental confusion	65	54	51	43	14	12
Calf tenderness	102	85	88	73	14	12
Restlessness	69	58	56	47	13	11

It is evident from the findings of the present study that the prevalence of clinical symptoms like dryness of skin, calf tenderness, mental confusion, restlessness, bleeding gums, general edema and white spots on nails, showed a reduction by 13,12,12,11, 10,9 and 9 per cent respectively. The other symptoms like sleep disturbances, paleness of face, paleness of tongue, worm infestation, improper digestion, stomach pain, brittle nails, rashes and roughness of skin also reduced to a lesser percentage. Clinical symptoms like allergy, mottled and discoloured enamel, dim vision, conjunctival xerosis, bitot' s spot, brittle and lusterless hair showed a very low reduction by 1-2 per cent. There was no change in the clinical symptoms like boils in skin, chalky teeth, flourosis and discolored hair. In general, some of the nutrition related clinical symptoms improved after supplementation.

3. Biochemical Parameters of the SHG Women

a. Mean Haemoglobin Levels of the Selected SHG Women

Table XLIII and Figure 18 present the mean haemoglobin levels of the selected SHG women before and after supplementation.

TABLE - XLIII

MEAN HAEMOGLOBIN LEVELS OF THE SELECTED SHG WOMEN BEORE AND AFTER SUPPLEMENTATION

Groups	Haemoglobin (g/dl)		Mean difference (g/dl)	't' value	Groups Compared	't' value
	Before (n=30)	After (n=30)				
E1	10.02 ± 0.42	11.12 ± 0.43	1.1	14.31**	E1 vs C1	8.99**
C1	9.67 ± 0.41	9.73 ± 0.65	0.06	0.78^{NS}		

NS – Not significant ,** - Significant at 1% level (p<0.01)

EI - Experimental group with anaemia CI - Contr2l group with anaemia

The mean haemoglobin content of both control and experimental group was found to be 10.01 and 9.67 g/dl respectively during the initial period. After four months of supplementation with araikeerai leaves powder incorporated nutri mix I

along with nutrition education improved the haemoglobin content of the experimental group I to 11.12 g/dl and the difference was statistically significant at one per cent level. In the case of control group the mean haemoglobin content was found to be slightly increased to 9.73g/dl after a period of four months with a difference of 0.06g/dl and it was found to be statistically not significant. This finding shows that the supplementation of nutri mix increased the haemoglobin content in experimental group. Comparison between experimental and control group showed that they are significant at one per cent level.

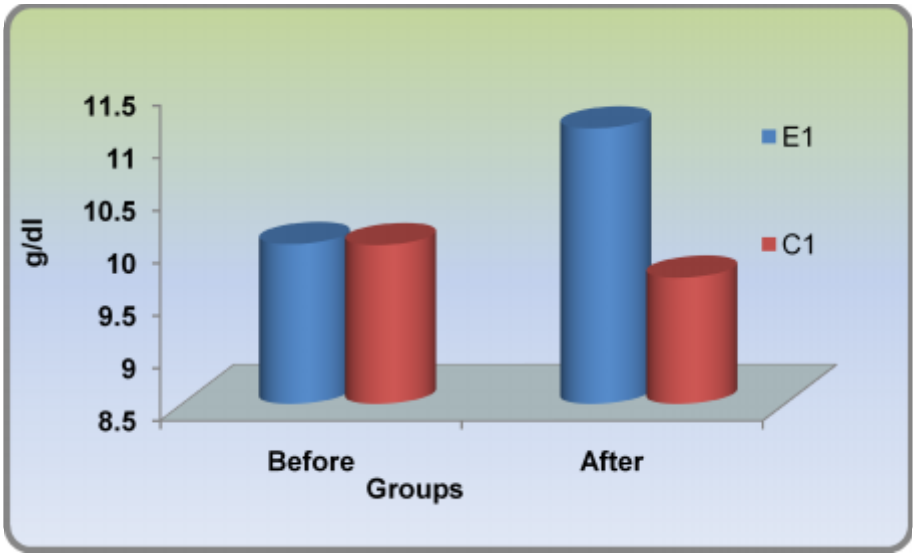

FIGURE 18- CHANGES IN HAEMOGLOBIN CONTENT OF THE SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

There is a greater scope to supplement the diets of SHG anaemic women with leafy vegetable powders to overcome anaemia. Sindhu *et al*., (2013) supplemented moringa oleifera and jaggery to the 15 – 45 years women belonging to lower socio economic strata for a period of 30 days and found a significant increase in haemoglobin levels.

b. **Mean PCV, RBC Count, MCV, MCH and MCHC**

Table XLIV presents the mean PCV, RBC Count, MCH , MCHC and MCV of the selected 60 SHG women in comparison with the reference values before and after the supplementation period.

TABLE - XLIV

MEAN PCV, RBC COUNT, MCH, MCHC AND MCV OF THE SELECTED SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

(N=60)

Parameters	Desirable levels#	Experimental group1				Control group 1			
		Before	After	Mean Difference	't' value	Before	After	Mean Difference	't' value
Packed Cell Volume (per cent)	36-38	31.20± 1.19	35.97± 0.86	4.77	22.91**	30.64± 0.94	30.74± 2.27	0.1	0.52^{NS}
MCV (fl)	80.00-100.00	72.57± 3.67	84.25± 3.46	11.68	28.15**	72.22± 4.24	73.14± 3.84	0.92	0.60^{NS}
MCH (pg)	27.00-31.00	22.31± 1.58	28.46± 0.89	6.15	23.16**	22.07± 1.46	22.10± 1.48	0.03	1.90^{NS}
MCHC (gm/dl)	32.00-36.00	28.98± 1.56	33.03± 0.80	4.05	12.70**	29.32± 1.33	29.36± 1.29	0.04	0.97^{NS}

Medline Plus, U.S. National Library of Medicine, 2015,

NS – Not significant ** - Significant at 1% level ($p<0.01$)

In both the groups the mean Packed Cell Volume was found to be lower than the reference value before the supplementation period, with a value of 31.20 per cent in experimental group and 30.64 per cent in control group respectively. But due to supplementation the experimental group had recorded a significant mean difference of 4.77 per cent and it was statistically significant at one per cent level.

The Mean Corpuscular Volume of experimental group before supplementation was 72.57 fl and it had increased to 84.25 fl after supplementation and statistically significant at one per cent level. The mean value of control group was 72.22fl and it slightly increased to 73.14fl after the study period which was statistically not significant

The Mean Corpuscular Haemoglobin of the selected SHG women in both the groups was found to be less than the reference levels. Supplementation of the nutri mix I increased the MCH values of the experimental group from 22.31pg to 28.46 pg with a mean difference of 6.15pg. The difference was found to be significant at one per cent level. Control group showed a slight increment in the MCH level by 0.03 pg which was statistically not significant .

Prior to supplementation, the experimental and control groups had lower MCHC than reference values. But due to supplementation a maximum increment of 4.05 gm /dl was observed in experimental group and it was statistically significant at one per cent level. In control group the increment was found to be very minimal (0.04gm/dl), which was statistically not significant.

c. Mean Serum Iron, Serum Ferritin, TIBC and Transferrin Saturation Levels of the Selected SHG Women

The mean serum iron, serum ferritin, TIBC and transferrin saturation levels of the selected anaemic SHG women is given in Table XLV and Figure 19, 20, 21 and 22.

TABLE - XLV

MEAN SERUM IRON, SERUM FERRITIN, TIBC AND TRANSFERRIN SATURATION LEVELS OF THE SELECTED SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

Parameters	Desirable levels#	Experimental group1				Control group 1			
		Before	After	Mean Difference	't' value	Before	After	Mean Difference	't' value
Serum iron (mcg/dl)	60-150	40.93± 2.20	57.87± 4.44	16.94	23.23**	41.77± 2.78	41.57± 2.88	-0.2	0.76^{NS}
Serum ferritin (ng/dl)	7.0 - 140	4.01± 0.09	4.72± 0.29	0.71	18.15**	4.00± 0.08	3.99± 0.07	-0.01	1.11^{NS}
TIBC (mcg/dl)	270-380	406.34± 20.93	375.03± 25.21	-31	18.15**	406.33± 26.44	414.37± 24.46	8.04	2.01^{NS}
Transferrin saturation (per cent)	20-45	10.10± 0.82	16.08± 1.87	5.98	21.80**	10.33± 1.03	10.07± 0.96	-0.26	0.48^{NS}

*- Significant at 1% level (p<0.01) NS – Not Significant

EI - Experimental group with anaemia CI - Control group with anaemia

- Tietz, N.W., (1976), Fundamentals of clinical chemistry, W.B. Saunders & co, P.928

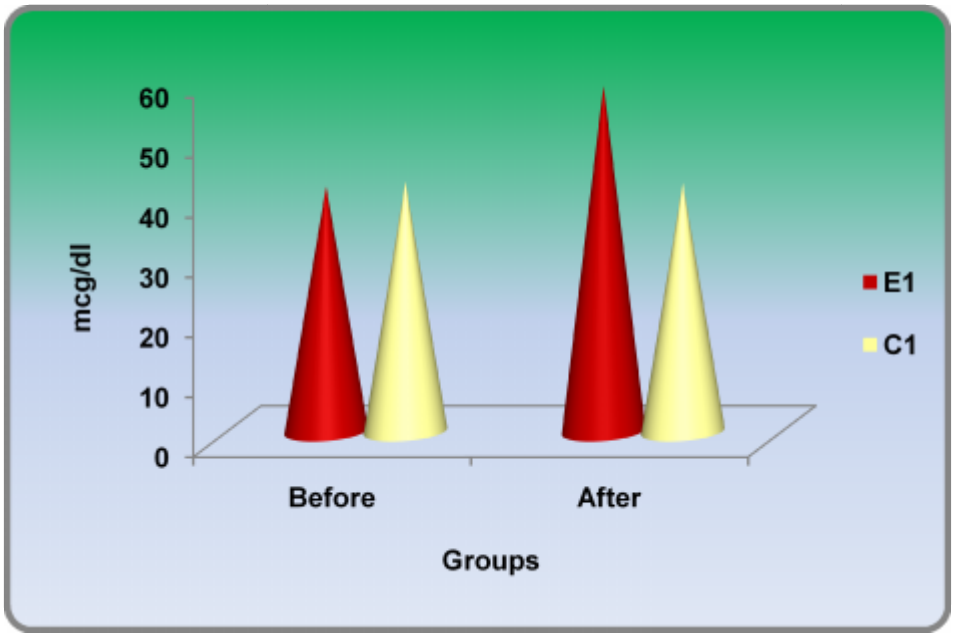

FIGURE 19- CHANGES IN SERUM IRON LEVELS OF THE SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

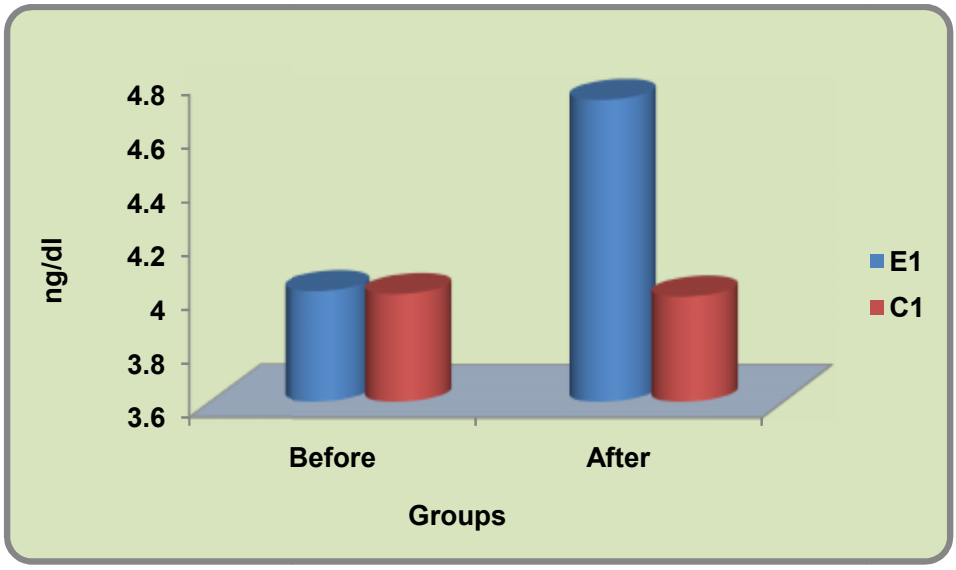

FIGURE 20- CHANGES IN SERUM FERRITIN LEVELS OF THE SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

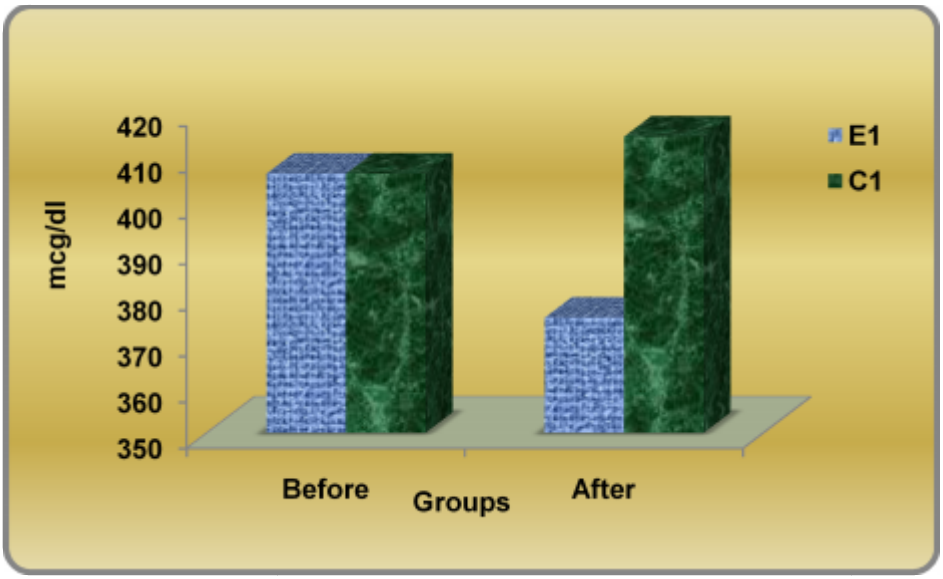

FIGURE 21- CHANGES IN TIBC LEVELS OF THE SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

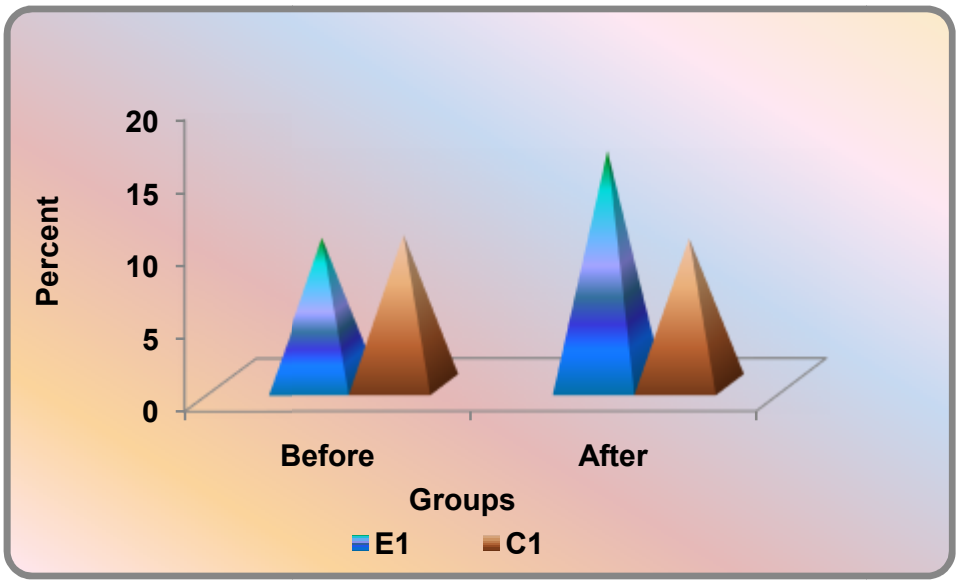

FIGURE 22- CHANGES IN TRANSFERRIN SATURATION OF THE SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

In both the groups the mean serum iron levels was found to be lower than the reference value before the supplementation period, with a value of 40.93 mcg/dl in experimental group and 41.77 mcg/dl in control group. Supplementation of the experimental group 1 with nutri mix I having Araikeerai leaves powder for a period of four months showed a considerable increase to16.94 mcg/dl in experimental group and it was statistically significant at one per cent level, whereas in control group there was a reduction in serum iron level by 0.2 mcg/dl and it was statistically not significant. This shows the beneficial effect of nutri mix I supplemented for four months in increasing the serum iron content in the experimental group. Comparison between experimental and control group indicated a statistically significant difference at five per cent level.

The mean serum ferritin levels of the experimental group before supplementation was found to be 4.01 ng/dl and it had increased to 4.72ng/dl after supplementation and statistically significant at one per cent level. In control group the initial and final serum ferritin was found to be 4.00ng/dl and 3.99ng/dl respectively and it was statistically not significant.

At the beginning the TIBC level recorded by both experimental and control group was within the range of reference value. But after the supplementation, significant decrease was noticed in the experimental group with a mean difference of 31mcg/dl , whereas in control group there was an increase in the TIBC level with the mean increase of 8.04mcg/dl. The decrease in TIBC indicates the reduction in iron deficiency due to supplementation.

Transferrin saturation of the experimental group and control group before supplementation was found to be 10.10 and 10.33 per cent. After supplementation, the transferring saturation of the experimental group was increased to 16.08 per cent which was statistically significant at one per cent level, whereas in control group it was only 10.07 per cent and it was statistically not significant.

d. Mean Serum Calcium Levels of the Selected SHG Women

The mean serum calcium levels of the selected SHG women is given in Table XLVI and Figure 23.

TABLE - XLVI

MEAN SERUM CALCIUM LEVELS OF THE SELECTED SHG WOMEN BEORE AND AFTER SUPPLEMENTATION

Groups	Serum calcium (mg/dl)		Mean difference (mg/dl)	't' value	Groups Compared	't' value
	Before (n=30)	After (n=30)				
E2	8.17± 0.22	9.12± 0.20	0.95	21.48**	E1 vs C1	11.66**
C2	8.15± 0.26	8.01± 0.43	0.04	0.70^{NS}		

** - Significant at 1% level (p<0.01) NS – Not Significant

E2 - Experimental group with low calcium levels

C2 - Control group with low calcium levels

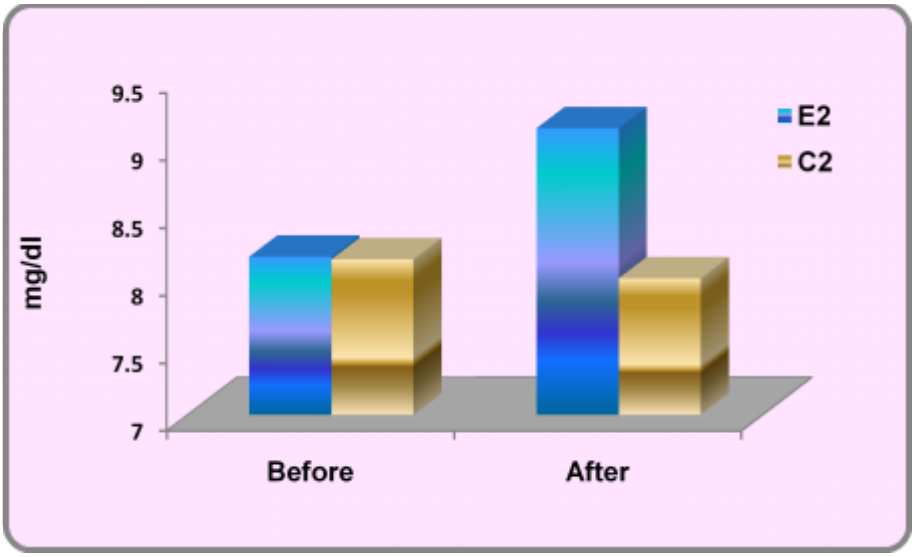

FIGURE 23 - CHANGES IN SERUM CALCIUM LEVELS OF THE SHG WOMEN BEFORE AND AFTER SUPPLEMENTATION

The findings of the study shows that the serum calcium levels of the experimental group 2 with nutri mix 2 supplementation for a period of four months increased the mean serum calcium levels from 8.17 to 9.12 mg/dl with a difference

of 0.95 mg/dl. This may be due to the high calcium content of the drumstick leaves powder incorporated nutri mix 2. In the case of control group the mean serum calcium level was found to be 8.15 mg/dl initially and after four months with no supplementation there was a slight reduction by 0.04mg/dl of serum calcium levels. This shows the significance of incorporating nutri mixes with drumstick leaves powder incorporation in the diet of the women. The mean serum calcium levels of the experimental group before and after supplementation was found to be statistically significant at one per cent level, whereas in control group it was not significant. Comparison between experimental and control group also showed a statistically significant difference at one per cent level. Study conducted by Kushwaha and Chawla (2015) among women in the age of 45 – 60 years concluded that concluded that consumption of 7g of drumstick leaves powder and 9g of amaranth leaves powder per day for three months significantly decrease the severity of postmenopausal symptoms.

E. Impact of Nutrition Education among the SHG Women

1. Knowledge, Attitude and Practice (KAP) Scores of the SHG Women

Table XLVII presents the mean KAP scores of the selected 120 SHG women before and after nutrition education.

TABLE - XLVII

MEAN KAP SCORES OF THE SHG WOMEN BEFORE AND AFTER NUTRITION EDUCATION

Maximum Score : 25 each

Details	Experimental group (E1 and E2)			't' value	Control group (C1 and C2)			't' value
	Before	After	Gain/loss in scores		Before	After	Gain/loss in scores	
Knowledge	7.68± 1.20	17.72± 1.83	+10.04	36.75**	7.35± 0.97	7.73± 1.19	+0.38	1.95^{NS}
Attitude	10.03 ± 2.54	17.68± 1.99	+7.65	17.56**	10.03± 2.54	9.93± 2.25	-0.1	0.55^{NS}
Practices	7.83± 1.08	16.8± 1.26	+8.97	47.54**	7.83± 1.08	7.96± 1.27	0.13	1.25^{NS}

** Significant at 1 per cent level (p<0.01) NS – Not significant

From the table the gain in mean KAP scores was found to be 10.04, 7.65 and 8.97 with reference to knowledge, attitude and practice scores respectively among experimental group and it was statistically significant at one per cent level. In the case of the control group, the gain/loss in knowledge, attitude and practice scores were negligible (0.38), which was statistically not significant.

The nutritional knowledge scores of both experimental and control group women before nutrition education was found to be low with 7.65 and 7.35 respectively among the groups. After nutrition education experimental group gained more scores in nutritional knowledge with a difference of 10.04 scores and the gain in scores was found to be statistically significant at one per cent level.

The attitude scores of the experimental and control group before nutrition education was only 10.03 in both the groups. Nutrition education improved the attitude scores of experimental group by 7.65 whereas a reduction was observed by 0.1 in control group. The increase was found to be statistically significant at one per cent level.

With regard to scores for nutrition practices, though a similar score of 7.83 was observed among both experimental and control group before nutrition education, but after nutrition education experimental group gained more scores by 8.97 whereas control group showed a reduction by 0.13 in scores. The high score in gain was found to be statistically significant at one per cent level.

Imparting nutrition education helped to gain more scores in nutrition knowledge, attitude and practice and the finding proved to be a best strategy to increase awareness and improve nutritional status of populations. Monga *et al*. (2008) expressed that in order to attain maximum health potential, there is a need to educate and create awareness among women about health, balanced diet, nutritional requirements and deficiency diseases.