RESULTS AND DISCUSSION

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The present study was planned with the broad objective of exploring problems related to diet and health and developing suitable measures for health promotion for the aged. The study covered many important aspects, which were investigated phase wise and evaluated for promoting health to the elderly. Two approaches were used for evaluation of health of the aged. (A) Nutrient supplementation and (B) Food based approach. To fulfill these objectives the study included four phases. (i) Assessment of problems concerned with food related activity, diet, nutrition and disease profile of elderly women with different living arrangements. (ii) Intervention with nutritional supplementation (tablets) of Iron Folic Acid in anemic women. (iii) Development and evaluation of suitable nutritious food items for geriatric group. (iv) Food based intervention with selected developed soy items in institutionalized elderly.

The results of each phase of the study are discussed in this chapter.

PHASE I:

ASSESSMENT OF PROBLEMS CONCERNED WITH FOOD RELATED ACTIVITIES, DIET, NUTRITION AND DISEASE PROFILE OF THE ELDERLY WOMEN WITH DIFFERENT LIVING ARRANGEMENTS AND AGE (60 YEARS AND ABOVE).

The study under this phase was carried out with following objectives: 1) To collect data on socio-demographic attributes and activity pattern. 2) To study the problems of elderly women regarding food related activities. 3) To assess the diet, nutrition and disease profile of the older women.

The present study is an exploratory one in nature. It was conducted in the urban settings of Vadodara city. Vadodara has a population of more than 13 lakhs of which 6.19% make up people above 60 years of age with almost an equal number of males and females (WSRC, 2005).

A stratified sample was selected using purposive criteria. After contacts with some respondents, the snowball technique was used to identify other respondents. A total

of 180 subjects from five zones of Vadodara city were enrolled. The parameters studied were 1) Socio demographic background 2) Activity pattern 3) Problems regarding food related activities and 4) Diet, nutrition and disease profile.

Living arrangements were categorized as women living alone (group 1), women living with spouse (group 2) and women living with family (group 3). They were also categorized as young-old (aged 60-75yrs) and old-old (aged >75yrs). Questionnaire was used to collect information on various parameters. Information was gathered regarding problems faced by the elderly while performing food related activities by questionnaire and observation during personal visits. The data obtained for following parameters were analyzed using appropriate statistical tests. Results are presented and discussed on the basis of living arrangements and age under the following heading:

1. SOCIO DEMOGRAPHIC PROFILE OF THE ELDERLY
2. ACTIVITY PATTERN
3. PROBLEMS WITH FOOD RELATED ACTIVITIES
4. DIET, NUTRITION AND DISEASE PROFILE

1. SOCIO DEMOGRAPHIC PROFILE OF THE ELDERLY

Pre tested questionnaire was used to obtain socio-demographic profile of the elderly subjects. The assessment included socio demographic information on age, education, religion, mother tongue, marital status and type of family. The data on socio demographic status of elderly women is shown in table 4.1.1.

Table 4.1.1: Socio demographic status of subjects belonging to different living arrangements

Characteristics	Group-1 Women living alone (n=60)	Group-2 Women living with spouse (n=60)	Group-3 Women living with family (n=60)	Total (n=180)
Age				
60—64	28.3(17)	33.3(20)	5(3)	22.2 (40)
65—69	10(6)	23.3(14)	6.6(4)	13.3 (24)
70—74	18.3(11)	16.6(10)	8.3(5)	14.4 (26)
75—80	21.3(13)	28.3(17)	43.3(26)	31.2 (56)
81—84	3.3(2)	6.6(4)	26.6(16)	12.2 (22)
>85	0(0)	3.3(2)	16.6(10)	6.7 (12)
Education				
Illiterate	0(0)	1.6(1)	6.6(4)	2.7(5)
Primary	38.3(23)	38.3(23)	31.6(19)	36.1(65)
10^{th} pass	16.6(10)	13.3(8)	16.6(10)	15.6(28)
12^{th} pass	8.3(5)	5(3)	6.6(4)	6.7(12)
Graduate	20(12)	20(12)	23.3(14)	21.1(38)
Postgraduate	16.6(10)	21.3(13)	15(9)	17.8(32)
Religion				
Hindu	88.3(53)	88.3(53)	90(54)	88.9(160)
Christian	3.3(2)	3.3(2)	0(0)	2.2(4)
Muslim	3.3(2)	3.3(2)	5(3)	3.8(7)
Punjabi	0(0)	1.6(1)	1.6(1)	1.1(2)
Parsi	3.3(2)	1.6(1)	0(0)	1.7(3)
Jain	1.6(1)	0(0)	3.3(2)	1.7(3)
Sikh	0(0)	1.6(1)	0(0)	0.6(1)
Mother Tongue				

Gujarati	75(45)	73.3(44)	83.3(50)	77.2(139)
Marathi	15(9)	15(9)	8.3(5)	13.3(23)
Malayalam	3.3(2)	1.6(1)	0(0)	1.7(3)
Tamil	1.6(1)	5(3)	3.3(2)	3.3(6)
Hindi	3.3(2)	3.3(2)	5(3)	3.8(7)
Punjabi	1.6(1)	1.6(1)	0(0)	1.1(2)
Marital Status				
Unmarried	11.6(7)	0(0)	3.3(2)	5.0(9)
Married	35(21)	100(60)	18.3(11)	51.1(92)
Widowed	53.3(32)	0(0)	75(45)	42.8(77)
Divorced/Separated	0(0)	0(0)	3.3(2)	1.1(2)
Type of Family				
Nuclear	83.3(53)	68.3(41)	50(30)	69.1(124)
Joint	8.3(5)	31.6(19)	50(30)	30.1(54)
Not applicable	3.3(2)	0(0)	0(0)	1.1(2)
Monthly Income (Rs)				
≤ 10,000	20(12)	25(15)	45(27)	30(54)
10,000 – 50,000	13.3(8)	20(12)	31.6(19)	21.6(39)
≥ 50,000	10(6)	20(12)	25(15)	18.3(33)
NA	45(27)	21.6(13)	23.3(14)	30(54)

Figures in the parenthesis denote number of subjects.

NA: Respondents who did not wanted to disclose their income

The above table 4.1.1 revealed that majority of the subjects was in the age group of 75 to 80 years (31.2 %) and among them 43.3% subjects belonged to elderly women living with family. With regard to elderly women living alone and living with spouse majority of subjects were in the age group of 60-64 years. Only 6.7 % subjects belonged to above 85years of age. Rest (22.2%) belonged to group of 60-64 years. It was surprising to know that more number of elderly women living alone were found in the older age group, i.e. 70-80yrs compared to younger age group.

The education of elderly women was up to primary for 36.1% of the respondents and 21.1% respondents studied till graduation. Only 2.7% of them were illiterate. Hundred percent literacy was found in elderly women living alone. A majority (88.9%) of the respondents followed Hindu religion irrespective to their living arrangements and age. The other religions followed were Christianity (2.2)% Muslim (3.8%), Sikh (1.6%), Parsi (1.7%) and Jainism (1.7%). With respect to mother tongue again a majority (77.2%) of the respondents spoke Gujarati followed by Marathi (13.3%). The other languages were Malyalam (1.7%), Tamil (3.3%) and Punjabi (1.6%). Ten to fifteen percent subjects were non-Gujarati. As far as marital status was concerned 51.1% of the respondents were married. In case of older age women higher percentages of widowed elderly were found (42.8%). Again majority (69.1%) of the respondents were residing in a nuclear family and (30.1%) had a joint family in past. Majority of subjects (30%) belonged to middle class and had income of $\leq$ Rs. 10,000/-, whereas highest number of elderly women living with family belonged to upper class families (25%). Twenty-seven percent of subjects living with spouse showed income of $\leq$ Rs. 50,000/-

2. DAILY ACTIVITY PATTERN

Information on daily activity pattern included time spent on routine, recreational, social, religious and leisure activities. Daily activity pattern and time spent for various activities by all the subjects are presented in table 4.1.2. The schedule in the table shows that reasonable time was spent in the household activities by all and especially by elderly women living alone and women living with spouse. They used to spend much of their time in purchasing and then cooking of the foods. Recreational activities comprised of gossip, chatting with grand children's and neighbors and watching television. Religious activity was carried out as per the time availability in the daytime except in the early morning. Religious activities comprised of puja in the morning, reciting mantras or god's name using beads, watching religious programs on television, reading books in the spare time and visiting a temple. Social activities included visiting neighbors, friends and relatives, attending functions and do shopping.

Table 4.1.2: Daily activity pattern and total time spent on various activities by the elderly women as per their living arrangements and age group

Type of activities	Living alone	Living with spouse	Living with family	Young-old	Old-old
Activity of Daily Routine Rise and carry out morning routine activities. Prayers at home. Get ready and do breakfast. Household chores like cleaning, dusting. Washing clothes and Kitchen chores	6-7hrs	5-6hrs	3-4hrs	6-7hrs	3-4hrs
Recreational activities Gossip with friends and neighbors, watch TV and to chat with grand children.	1-2hrs	2-3hrs	2-3hrs	2-3hrs	1-2hrs
Religious activities Temple visit, attend sabhas/ bhajan sandhyas, perform puja and chanting of mantras.	1-2hrs	1-2hrs	2-3hrs	1-2hrs	2-3hrs
Social activities Visit friends / neighbours, attend senior citizen association functions, sometimes do shopping.	2-3hrs	1-3hrs	2-3hrs	2-3hrs	1-2hrs
Leisure time activities Watch TV, gossip, read news papers/ magazine, rest and sleep.	3-4hrs	3-4hrs	4-5hrs	3-4hrs	4-5hrs
Exercise Walking	1-1& 1/2hr	1hr	1hr	1-1& 1/2hr	1hr

From table 4.1.2 it can be also found that subjects who were living with their family were living a total sedentary lifestyle compared to subjects living alone and with spouse and especially from younger age group, who were involved in house hold work like cooking and other kitchen activities, cleaning and winding up. With regard to age group also it was found that old-old group subjects were leading a total sedentary life and they were spending more time in religious and leisure activities as compared to young old group subjects who were more occupied in kitchen chores and social activities where more physical work was demanded.

Chadha et al. (2006) studied the activity pattern of the elderly. In the household activities such as housekeeping and cooking, significant differences was found between the married and the widowed group ($p<0.001$) were as no significant differences were found between married and singles at any level.

3. PROBLEMS OF FOOD RELATED ACTIVITIES

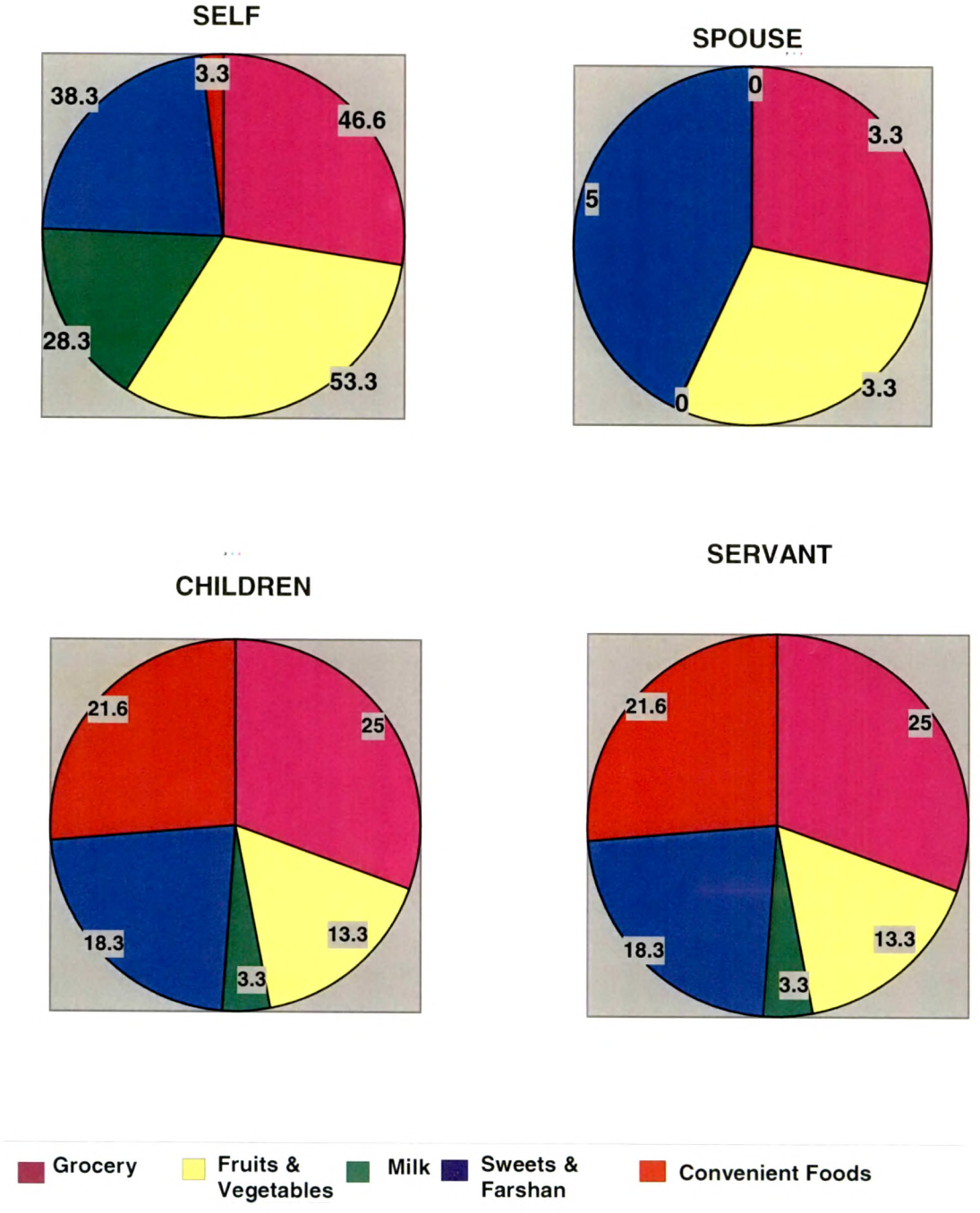
Food related activities usually included all the activities related to food, ranging from purchasing of the food, storing of the food, pre-preparation of food, cooking of the food, eating / serving of the food and cleaning after eating and winding up of the kitchen. Other associated minor efforts related to food also demands lots of planning. It was interesting to know whether type of living arrangements has any influence on food related activities. In joint family there are other members helping where as subjects living alone and with spouse do not have such manpower. Avoidance and simplification are some of the compromises that are made by such elderly women, which may adversely affect the food intake, nutritional status and increase their physical morbidity. This in turn has influence on the functional capacity and efficiency to carryout the food related activities with advancing age. Keeping this in mind questionnaire was prepared which could collect information on each of the food related activities and problems faced by elderly women belonging to different living arrangements and different age groups. Data for each activity is presented separately.

(a) Purchasing: -

Information on purchasing included activities like purchase of various food items by subjects as well as by different sources. With regard to purchasing of foods following views were obtained from different living arrangements. The problems mainly varied with respect to perishability of foods. Data is presented in figure 4.1.1.

With regard to living arrangements self-purchase of grocery by women living alone was 46.6%, 43.3% from women living with spouse and 20% subjects from women living with family. In case of fruits and vegetables 70% women living alone, 58.3% from women living with spouse and 25% subjects from women living with family. Very few elderly women were purchasing milk by themselves. Thirty-eight percent of elderly women living alone purchased sweets and farshan by themselves as compared to <10% by subjects belonging to women living with spouse and family. Regarding purchasing of food items

Figure 4.1.1: Percentage of elderly women with different source of help for purchase of various food items



by younger group data showed that self-purchase of grocery was done by 54.4%, fruits and vegetables by 58.9%, milk by 21%, sweets and farshan by 33.3% and convenient foods by 5.6% of the subjects. On the other hand, in older group self-purchase in case of grocery was done by 18.9%, fruits and vegetables by 39%, milk by 56%, sweets and farshan by 11.1% and convenient foods by 5.6% subjects.

With different living arrangements purchase of grocery by spouses in-group of women living with spouse was by 48.3% and 15% from women living with family, followed by purchase of fruits and vegetables by 46.6% spouses in women living with spouse and 18.3% from women living with family respectively. Purchase of milk by spouses was only 20% in-group of subjects living with spouse and 8.3% in subjects living with family. In subjects living with spouse purchase of sweets and farshan by spouses was 60% as compared to 11.1% spouses in case of subjects living with family. In case of convenient foods 23.3% spouses helped women in purchasing compared to only 3.3% spouses of women living with family. Purchase by spouse in case of younger elderly group for various food items were grocery 27.8%, fruits and vegetables 30%, milk 11.1%, sweets and farshan 28.9% and 9% for convenient foods. In older elderly 16.7% of women's spouses purchased grocery, fruits and vegetables purchased by 15.6%, purchase of milk by 7.8%, sweets and farshan by 22.2% and convenient foods by 8.9% of women's spouses.

With regard to purchase of various items by children, majority times children used to buy for subjects living with family like 66.6% children purchased grocery, fruits and vegetables by 60%, sweets and farshan by 70% and convenient foods by 46.6%, compared to elderly women living alone and living with spouse which was approximately <20% for various items. A similar picture immerged when women with different age groups were studied. The data showed that in younger group grocery was purchased by 24.4%, fruits and vegetables by 20%, milk 56% sweets and farshan by 26.7% and convenient foods by 31.5%. In case of older group, purchasing by children showed that items like grocery was purchased by 46.7%, fruits and vegetables by 36.7%, milk 8.9% sweets and farshan by 38.9% and convenient foods by 31.5%.

With respect to living arrangements purchase of food items by servants were reported more in case of milk i.e. 65% for women living alone, 63.3% for women living with spouse and 70% for women living with family, followed by purchase of grocery by 33.3% for women living alone, 28.3% for women living with spouse and 10% for women living with family. Regarding other food items very few groups were sending servants for purchasing except elderly women living alone where servants were sent for purchasing of fruits and vegetables in 13.3% cases and 18.3% for sweets and farshan. Various food items purchased by servants in younger group were reported as follows. Purchase of grocery was by 18.9%, fruits and vegetables by 4.4%, milk by 65.6%, sweets and farshan by 7.8% and 11% in case of convenient foods. In older elderly, purchase of various foods by servants in case of grocery was by 28.9%, fruits and vegetables by 12.2%, milk by 66.7%, sweets and farshan by 11.1% and convenient foods by 11%.

The data on purchasing of various food items by various members' as shown in figure 4.1.1 reveals that in majority of subjects, self-purchasing was preferred the most, especially, with regard to women living alone and with spouse. This shows that these groups did not have any help and support for such activity except when daily foods were consumed like milk where majority of subjects were dependent on servants.

Table 4.1.3 shows the source of purchase of various food items by elderly women in terms of self and others.

Table 4.1.3: Percentage of elderly women showing source of purchase of various food items (n=180)

Category	Grocery	Fruits and vegetables	Milk	Sweets and Farshan	Convenient foods
Self	36.6(66)	45.5(82)	18.3 (33)	22.2 (40)	64.4(116)
Others	63.5(114)	54.4(98)	81.6(147)	77.7(140)	35.5(64)
Total	100(180)	100(180)	100(180)	100(180)	100(180)

Figures in the parenthesis denote number of subjects.

The overall picture of purchase for different food material as can be seen in table 4.1.3 depicts that age and living arrangement categories has produced the same results. Self-purchasing activity was found more among the subjects and especially for fruits and vegetables where elderly women were self- dependent (45.5%) (Figure 4.1.1).

Table 4.1.4 shows the percent frequency of purchase of various food items by elderly women (n=180).

Table 4.1.4: Percentage of elderly women showing frequency of purchase of various food items (n=180)

Categories	Grocery	Fruits and vegetables	Milk	Sweets and Farshan	Convenient foods
Daily	2.2(4)	27.2(49)	95.0(171)	0.5(1)	00
2-3times / wk	13.8(25)	66.1(119)	5.0(9)	15.0(27)	1.1(2)
Monthly	48.8(88)	5.0(9)	00	59.4(107)	24.4(44)
Yearly	66.1(119)	6.11(11)	00	1.6(3)	12.2(22)

Figures in the parenthesis denote number of subjects.

With regard to frequency of purchase in case of grocery in a majority of cases in all the groups it was purchased on yearly basis (63 to 69%). Frequency of purchase of fruits and vegetables was 2-3 times/week (63.3% in younger group and 68.9% in older group). Elderly women living alone preferred the most i.e. 73.3%, women living with spouse was 2.65% and 60% by women living with family. Among all the subjects majority of times perishable food like milk was purchased daily by 95% of subjects and rest 5% of subjects were purchasing in bulk for 2-3 times per week. This must be because of inconvenience / difficulty in performing such task every day. Regarding sweets and fashan, younger group reported of purchasing on monthly basis (52.2%) compared to 66.7% cases in older group, whereas 55% of women living alone, 58.3% of women living with spouse and 65% of women living with family preferred to buy monthly, followed by 2-3 times /week in a range of 11-16% subjects. Very few

reported of purchasing on monthly basis by about 13.3% of women living alone, 16.6% of women living with spouse and 43.3% of elderly women living with family.

Among younger elderly subjects in majority cases (56.7%), the distance, from house to shop was <1/2 km in case of grocery, 65.2% for fruits and vegetables, 66.7% for milk and 37.8% for sweets and farshan. Similar results were obtained for elderly group also. For convenient foods, > 1 km was reported by 36.6% of women living alone, 48.3% of women living with spouse and 35% of women living with family.

Age group wise elderly women were also asked about their choice of purchase and whether their choice was affected if they did not purchase by themselves. Responses obtained from elderly women are shown in table 4.1.5.

Table 4.1.5: Percentage of the elderly women showing influence of help in purchase activity of various foods

	Grocery		F and V		Milk		Sw and Fa		Con. Foods	
	YO %	OO %	YO %	OO %	YO %	OO %	YO %	OO %	YO %	OO %
Yes	33.3	45.55	30.0	54.44	11.11	24.44	22.22	28.64	16.66	16.66
No	66.6	54.44	70.0	45.55	88.88	75.55	77.77	72.22	83.33	83.33

Fruits : F, Sweets : Sw, Convenient Foods : Con. Foods.
Vegetable :V, Farshan :Fa, Young- old : YO(n=90), Old-Old : OO(n=90).

Table 4.1.5 reveals that majority of the responses fell in the "no" category, which showed that it was a positive attitude towards the activity and all subjects were satisfied if others purchased foods for the house. Except under fruits and vegetable purchase, slight differences were noted among old-old women, showing unsatisfied response. In a study by Schlettwein-Gsell et al. (1991) on 2586 elderly, survey was conducted on dietary behavior. The findings of the study reported that shopping was always preferred in the walking distance areas only. Reduction in dietary intakes was noticed if access to food shops was not available in near by places.

Table 4.1.6 shows the percentage of elderly women facing problems while purchasing foods.

Table 4.1.6: Percentage of subjects facing difficulties in purchasing of foods

Difficulties	Women living alone n=60	Women living with spouse n=60	Women living with family n=60	Young old n=90	Old old n=90
Cannot see properly in dim light	25 (15)	25 (15)	13.3 (8)	22.2 (12)	31.1(26)
Carrying bag	11.6 (7)	11.6 (6)	25 (10)	16.6 (10)	21.6 (13)
Counting money	11.6 (6)	11.6 (6)	60 (20)	20 (14)	33.3 (18)
Roads are irregular / crossing roads	8.3 (5)	11.6 (6)	13.3(8)	13.3 (6)	15.5 (13)
Market is crowded	13.3 (8)	13.3(8)	6.6 (4)	16.6 (11)	5.5 (9)
Not applicable	(19)	(19)	25 (10)	(37)	(11)

Figures in the parenthesis denote number of subjects.

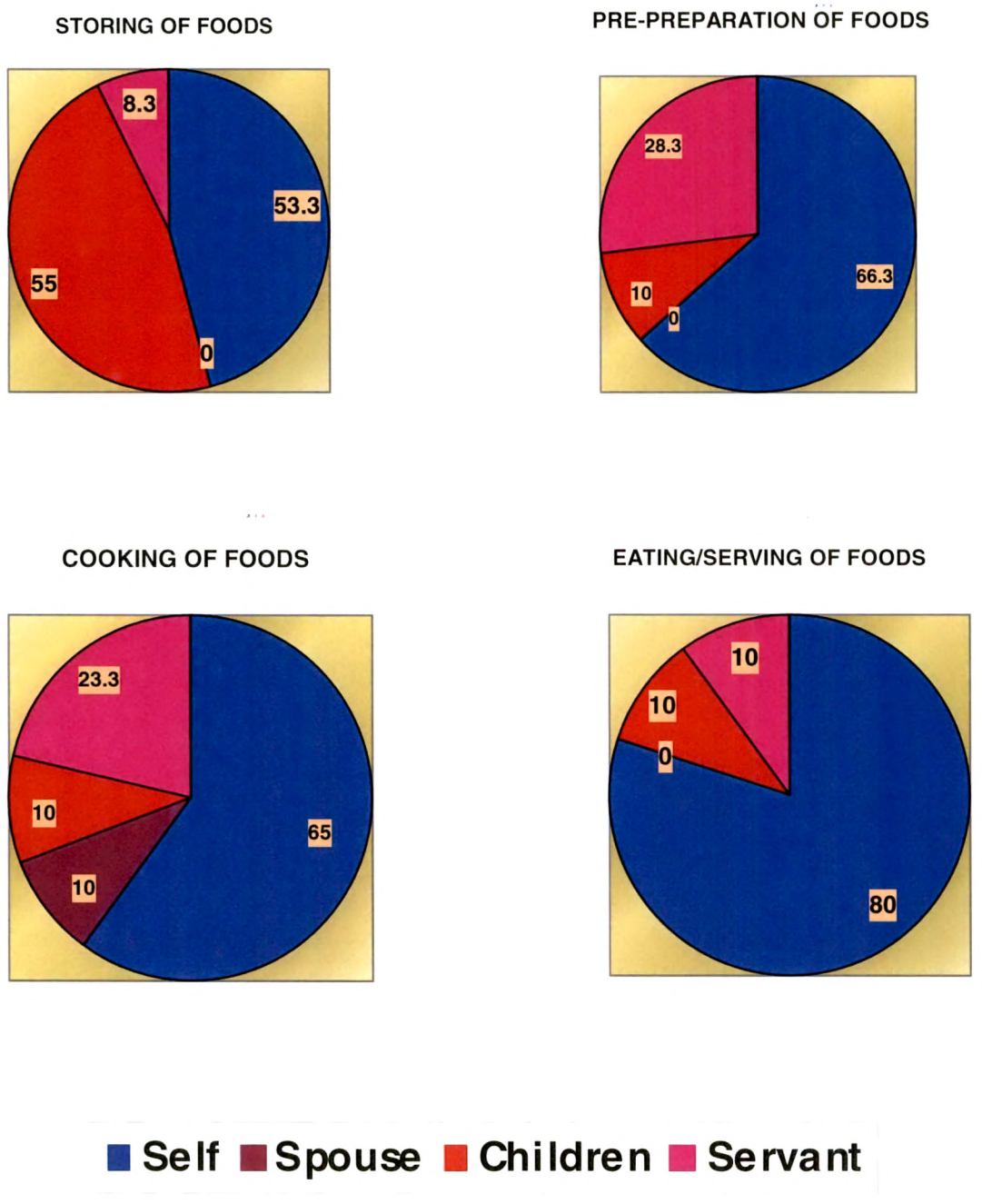
Table 4.1.6 reveals that elderly women faced many problems during purchasing of foods. With regard to living arrangements and age groups women living with family and old old group women reported more problems. Majority of elderly found problems with counting of money (32%) and improper vision in dim light (38%) with purchase of foods.

Thus, from the above data it can be noted that elderly women living alone has to suffer the most for carrying out the activity.

(b) Storing: -

Under this activity, information like source of help for the activity and difficulty in handling stored foods was collected. Data on source of help for storing of foods is presented in figure 4.1.2. In majority of the subject's activity like storing of food was done by

Figure 4.1.2: Percentage of elderly women with different source of help for various food related activities



themselves i.e. an in-elderly women living alone (53.3%) and with spouse (66.6%). Women living with family had support of children and servants to help with storing activities, 36.6% and 40% respectively. In younger group, with regard to storing of food items 54.4% subjects did it by themselves, 52.2% subjects were helped by children and 12.2% subjects helped by servant. In older group it was 42.2% in case of children as well as self-help, 24.2% by servant and 11.1% by others. Thus, except for very old women, all respondents managed storing of foods by themselves with little support. Along with storing of foods data was also collected on various difficulties faced by subjects during handling of stored foods. Data is presented in table 4.1.7.

Table 4.1.7: Percentage of subjects with different living arrangements and age groups facing various difficulties in handling stored foods

Difficulties	Women living alone n=60	Women living with spouse n=60	Women living with family n=60	Young old n=90	Old old n=90
Unable to reach	8.3 (5)	8.3 (5)	6.6 (4)	8.9 (8)	6.7 (6)
Cannot see properly	1.5 (1)	1.5 (1)	3.3 (2)	3.3 (3)	1.1 (1)
Cannot open container	4.5 (3)	1.5 (1)	1.5 (1)	3.3 (3)	2.2 (2)
Climbing problem	13.3 (8)	11.6 (6)	3.3 (2)	8.9 (8)	10 (9)
Sitting down & getting up	15 (9)	21.6 (13)	6.6 (4)	16.7 (15)	12.2 (11)

Figures in the parenthesis denote number of subjects.

Table 4.1.7 shows that difficulties were more faced by elderly women living alone and living with spouse. Difficulties like sitting down and getting up (22% subjects living with spouse and 15% subjects living alone) and climbing (13% subjects living alone and 12% subjects living with spouse) were reported in more number of elderly women in general. In case of younger elderly, majority reported problems in sitting down and getting up (16.7%), followed by problems like climbing 8.9% and inability to reach things on higher shelves by 8.9%. The same trend was observed for respondents in

older group as well. This shows that with the urban arrangement of having a standing platform, most of the things are stored beneath the platform and a few on the top shelves. Thus respondents have mentioned problem of sitting down and getting up the most. Climbing and inability to reach may be because of small stature or heavy weight lifting problem and stiffness of joints, which resulted in difficulty for very old age women. It may be noted that prevalence of arthritis (refer table 4.1.26, 41.1% in young and 28% in old subjects) was higher and this might be important contributing factor.

(c) Pre preparation of foods: -

Percentage of elderly women showing different source of help for various food related activities like pre preparation of food, cooking and eating is presented in figure 4.1.2 itself. This graph shows the percentage of work/ activity carried out by subjects themselves, or with the help of spouse, children or servant.

Under this activity the data was collected on source of help while performing the activity, types of electrical appliance used and problems faced by the subjects with the use of those appliances. Large number of elderly with different living arrangements mentioned themselves as source of help for pre preparation of food (68.3% in case of subjects living alone, 83.3% women living with spouse and 55% by women living with family) followed by help from servants (28.3% for subjects living alone, 21.6% for women living with spouse and 13.3% for women living with family) and help from children which was highest for women living with family (45%).

In case of younger elderly pre preparation of foods in majority of subjects was done by self (77.8%), followed by (23.3%) help from servants, help by children in case of 15.6% subjects whereas 3.3% subjects were helped by their spouses. In older group little change was observed i.e. 60% subjects were doing by themselves. For 24.4% subject's children helped and in case of 18.9% subjects servant helped in the activity. Ten percent subjects reported help from other person and 2.2% from spouse.

The above data reveals that though majority of subjects were independent in carrying out the activity, elderly women living with family and older group women had a

support of children. As far as source of help by servants are concerned, younger women across ages and women living alone preferred to have paid servants. Spouses were only helpful when they were living with them, especially in younger group.

In the subjects with different living arrangements, most of the subjects were using electrical appliances like food processor /mixer (>90%) followed by hand blender (61% to 73%) and flour- mill (38% to 51%). Oven and toaster were the least used appliances. Minimum number of elderly women (22.22%) reported difficulties in operating them. The reasons of facing difficulties while using electrical appliances are reported in table 4.1.8. All the elderly women faced very few difficulties. Difficulties were more faced by women living with spouse and young old group women then any other groups.

Table 4.1.8: Percentage of elderly women with different living arrangements and age groups facing different type of difficulties while using electrical appliances

Reasons	Women living alone N=60	Living with spouse N=60	Living with family N=60	Young Old N=90	Old Old N=90
Fear	1.6(1)	3.3(2)	1.6(1)	4.3(3)	1.3(1)
Do not Know	00	3.3(2)	8.3(5)	4.3(3)	5.0(4)
Shivering Hands	11.6(7)	3.3(2)	3.3(2)	5.7(4)	8.8(7)
Difficulty in Handling	18.3(11)	25(15)	18.3(11)	27.1(19)	22.5(18)
Difficulty in Gripping	13.3(8)	15(9)	6.6(4)	12.9(9)	15.0(12)

Figures in the parenthesis denote number of subjects.

As per table 4.1.8, the most common difficulties faced by majority of subjects were difficulty in handling electrical appliances, followed by difficulty in gripping appliances

and shivering hands. Other subjects' did not report difficulties because of help from other members/sources or avoidance of use of such appliances.

(d) Cooking: -

All the subjects were asked whether they carried out this activity independently or with the help of others and whether they face any type of difficulty. Results about source of help in cooking and problems faced while cooking are as follows.

According to figure 4.1.2, self cooking was highest among elderly women living alone and living with spouse which was found to be 65% and 78.3% respectively, followed by the assistance by servants for women living alone (23.3%) and women living with spouse (18.3%). As far as women living with family were concerned, children helped 38.3% subjects, 33.3% subjects were helped by assistance and in case of 31.6% subjects self- cooking was reported. In case of younger group self-cooking was reported by 65.9%, help of assistance in cooking was for 18.9 % subjects, in 12.2% cases cooking was done by children and in 17.8% cases cooking of foods was done by the cook. In case of older group, 51.1% subjects cooked by themselves, 16.7% subjects cooked with the help of assistance, cooking by children was carried out in case of 23.3% subjects and cooking by hired cook was done in case of 21% subjects.

Table 4.1.9 reports the percentage of elderly women facing different types of difficulties during cooking. This information was collected since compromises in daily cooking may lead to changes in diet pattern and nutritional status.

Table 4.1.9: Percentage of elderly women with different living arrangements and age groups facing different types of difficulties during cooking

Difficulties	Women living alone N=60	Living with spouse N=60	Living with family N=60	Young Old N=90	Old Old N=90
Standing platform	6.6 (4)	11.6 (7)	5 (3)	7.8 (7)	7.8 (7)
Sitting down & getting up	55 (33)	48.3 (29)	13.3 (8)	34.4 (31)	43.3 (39)
Unable to see small things	13.3 (8)	6.6 (4)	6.6 (4)	8.9 (8)	8.9 (8)
Cannot cope up	5 (3)	3.3 (2)	6.6 (4)	7.8 (7)	2.2 (2)
Pain in shoulders	16.6 (10)	26.6 (16)	18.3 (11)	31.1 (28)	12.2 (11)
Distance in kitchen long	6.6 (4)	00	00	2.2 (2)	2.2 (2)

Figures in the parenthesis denote number of subjects.

With regard to living arrangement, data showed in table 4.1.9 revealed that the most difficult problem faced was of sitting down and getting up which was maximum faced by subjects living alone (55%), compared to women living with spouse (48.3%) and family (13.3%). In case of age groups, women from older age group faced higher problem of sitting down and getting up (43.3%) compared to younger group women (34.4%).

When self-cooking was done by younger elderly, 34.4% faced difficulty it sitting down and getting up, 31% subjects reported of pain in shoulders. In addition older elderly faced some more problems because of a standing platform (7.8%) and inability to see small things (8.8%). As discussed later in this phase (refer table 4.1.14) adjustments are made with the evening meal to overcome this activity. Such attitude of elderly will put them in to negative balance with regard to their food and nutrient intake. Therefore there is a need of quick cooking foods, which can fulfill at least $1/4^{th}$ to $1/5^{th}$ requirement of nutrients.

Certain information related to cooking was also collected. The findings are discussed here. Majority of the subjects from all groups did not report any problems when a cook was employed for the activity. Reasons were given that with increase in age, there is an increase in level of arthritis, leading to stiffness, inability to bend and problems with fine joint movements. Respondents who were negative could be due to the traditional custom and belief in their family, that only housewife should cook. It could also be due to rigidity in the behavior. When they were asked whether they planned their menu, total 60.5% of elderly women replied positively. Interestingly, elderly women also agreed that they compromised with the preparation of meals. The type of daily adjustments with cooking included avoiding elaborate food preparations (highest, 6.6% elderly women living alone) followed by preparation of two meals at one time (highest, 13.3% were women who where living alone) and avoiding preparation of full meals (10%, women living alone). Avoiding preparation of full meals was observed more on occasional basis by women living with family (30%), followed by women living alone (11.6%) and women living with spouse (8.3%). For all the types of adjustments, much differences were not found among women belonging to different ages.

(e) Eating/serving: -

With increase in age, difficulty in joint movements and shivering of the hands causes difficulties during eating and help is needed.

Data on source of help in eating/serving foods (figure 4.1.2) showed that majority of subjects (>80%) irrespective of living arrangement and age groups did not take any help. However, in the old age group women 11.6% subjects felt the need of assistance while eating. More than 76% respondents did not report any problems or difficulties while eating, only 18.3% expressed the feeling of loneliness which was mainly faced by elderly women who were living alone (38.3%) and minimum faced by elderly subjects living with family (5.0%). This data revealed that elderly women strongly experienced feeling of loneliness. Loneliness and depression have been reported to be important determinants of food intake.

Kumari A (1999) in her review on nutrition in old age has reported the negative influence of psychological factors like worry, fear, anxiety and loneliness on actual dietary intake and utilization of nutrients, especially among elderly living alone.

As shown from the figure on source of help for various food related activities, it can be summarized that for all major activities in majority of cases it was carried out by women living alone followed by women living with spouse and with family. In case of age groups old-old subjects suffered more as compared to young-old subjects.

4. DIET, NUTRITION AND DISEASE PROFILE

Dietary aspects, nutritional status as well as general health and morbidity profile of the elderly women are greatly affected by daily compromises that are made for meals.

Considering the influence of both age as well as living arrangements, data on dietary aspects, nutritional status in terms of anthropometric measurements, clinical parameters like hemoglobin levels, blood glucose, blood pressure, general health profile and morbidity profile in terms of minor and major illnesses was obtained accordingly and are presented below.

(a-i) General dietary habits

Dietary profile of the subjects included general dietary information of the elderly with respect to their living arrangements and age groups. This data included information on meal pattern, type of diet, munching of foods, eating practices, fasting pattern, meal substitutes, food related problems and type of adjustment made with evening meals. The data is presented in different tables. Data on aspects like type of diet, munching of foods and eating practices are presented in table 4.1.10.

Based on the information related to dietary habits it was found that 91% of the elderly women were vegetarian with majority falling in the old-old group. About 55% of the subjects were taking their regular meals with at least four meals in a day. These meals included very light snacks in the evening. Very few subjects had a habit of munching of foods (16%). Among different living arrangements and age groups, 20% subjects living with family and 18% subjects from young-old group had habit of

munching of foods respectively. With respect to the type of diet, 72.78% elderly women were following normal diet irrespective of their age and living arrangement, of which 24.4% subjects followed salt restricted diet (majority, 1/3rd were from group 3) and 18.89% followed sugar restricted diet. The main reasons noted for these diet preferences were health reasons as conditions like high blood pressure (39.4%) and diabetes mellitus (17.2%) were recorded in the subjects. When eating practices of the elderly women were compared it was reported that 39% subjects were eating alone of which majority belonged to younger elderly group (50%) and subjects eating with family were around 27% (majority belonged to women living with family and from old-old group). Eating without company can lead to low food intake resulting in under nutrition in elderly women living alone and eat alone. Some of the subjects reported deprivation of enjoyment of meals while eating alone. On receiving such responses towards the meals, elderly where asked whether they make any type of changes in their regular meal pattern.

Table 4.1.10: Percentage of elderly belonging to different living arrangements and age groups showing different dietary practices

Dietary practices	Living alone % (n=60)	Living with spouse % (n=60)	Living with family % (n=60)	Young-old % (n=90)	Old-old % (n=90)	Total (n=180)
Vegetarian	90 (54)	91.6 (55)	91.6 (55)	90 (81)	92.2 (92)	91.11 (164)
Non-vegetarian	9.8 (6)	8.3 (5)	8.3 (5)	10 (9)	7.8 (7)	8.89 (16)
Type of Diet						
Normal	75 (45)	75 (45)	68.3 (41)	90 (81)	55.5(50)	72.78 (131)
Soft	8.3 (5)	8.3 (5)	13.3 (8)	10 (9)	10 (9)	10 (18)
Bland	6.65 (4)	1.5 (1)	00	2.2 (2)	2.2 (2)	2.78 (5)
Liquid	3.3 (2)	4.5 (3)	14.8 (9)	13.3 (12)	2.2 (2)	7.78 (14)
Salt Restricted	23.3(14)	20 (12)	30 (18)	26.6 (24)	22.2 (20)	24.4 (44)
Sugar Restricted	13.3 (8)	23.3 (14)	20 (12)	22.2 (20)	15.5 (14)	18.8 (34)
Munching of Foods	15 (9)	11.6 (7)	20 (12)	20 (18)	11.1 (10)	15.56 (28)
Eating Practices						
Alone	100 (60)	5 (3)	13.3 (8)	50 (45)	28.9 (26)	39.4 (71)
With spouse	00	87.3 (57)	8.3 (5)	34.4 (31)	34.4 (31)	34.4 (62)
With family	00	00	78.3 (47)	9 (10)	41.1 (37)	26.6 (47)

Figures in the parenthesis denote number of subjects.

With regard to substitute to the meals following responses were obtained from elderly women. Table 4.1.11 shows the data on the type of substitutes for the meals preferred by elderly women.

Table 4.1.11: Percentage of elderly women showing frequency of substitutes for the meal with reasons (N=180)

Food Item	Frequency	%	Substitute To meal	Reasons
A) 1. Milk	1 cup	24.4	Dinner (12.2%)	During Fasting
2. Bread	Once a week	50	---	Convenient, Easy to chew & digest
3. Farshan	Occasionally	63.3	Dinner (16.1%)	Easy availability
4. Tiffin	Occasionally	26.1	---	Convenient
5. Ready food	Occasionally	3.3	---	Convenient
B) 1. Eating Out- - Thali/Fast food/ meal of choice	Occasionally	56.6	---	For a change

The above table shows the type of food items taken as substitute against the major meal of the day. Generally it was observed that compromise was done for the evening meal only as elderly feel that eating bulky and heavy foods gives them uncomfortable feeling at late night. Therefore light and easy to prepare food item was more desirable. One cup of milk was substituted by 24% of subjects especially for evening meal when subjects (12.2%) used to observe full fasting. The table also shows that among all food item bread was the best preferred item since it was easily available, cheaper, and easy to eat and digest. When data was further categorized it was found that almost 50% elderly preferred bread as meal substitute, irrespective to living arrangement and age. More than 60% elderly subjects also preferred Farshan as a meal (occasionally) in both the groups, out of these 16% subjects preferred at the dinnertime. Ready foods and Tiffin's were not much preferred because of cost and inconvenience to adjust with outside foods. As far as "eating out" behavior was

concerned, 56.6% elderly preferred to eat occasionally. Here difficulty in transportation, inconvenient timings and suitability of foods were major reasons reported by them.

Along with meal pattern information on their fasting pattern were also collected. Following table 4.1.12 shows the type of fasting observed by elderly women along with frequency of fasting and reasons.

Table 4.1.12: Percentage of elderly women with different fasting pattern and their reasons (n=180)

Nature of fasting	Percentage	Frequency of Fasting	Reasons
Full Fasting	11.11	Not Frequent	Religious
Milk and Fruit	17.73	Not Frequent	Religious and health purpose
Non Cereal Foods	12.78	Not Frequent	Religious
One Meal a Day	26.11	Not Frequent	Religious and health purpose
No Fasting	58.33	---	Health do not permit

From the above table 4.1.12 it can be seen that majority (58.33%) of elderly women do not fast due to health reasons. Full fasting was observed by 11.1% subjects, of which majority were elderly women living with family and were from younger group. Rest of the subjects was either taking milk and fruit or non-cereal foods. Out of total subjects 26.1% used to take only one meal a day during fasting and again majority subjects belonged to family and from younger group. General reason quoted for fasting was "religious purpose".

Subjects were following different meal pattern along with different types of diet, therefore it was thought to collect information on food related problems among elderly women. Following table 4.1.13 depicts percentages of elderly subjects with different living arrangements and age group showing food related problems (of GIT).

Table 4.1.13: Gastrointestinal tract related problems among elderly women belonging to different living arrangements and age groups as percentages

Problems	Women living alone in % N=60	Women living with spouse in % N=60	Women living with family in % N=60	Young - Old in % N=90	Old –Old in % N=90
Chewing	45 (27)	35 (21)	31.6(19)	32.2(29)	42.2(38)
Swallowing	11.6(7)	3.3 (2)	8.33 (5)	6.6(06)	8.88(08)
Digestion (constipation, diarrhoea, acidity, flatulence)	100 (60)	75 (45)	98.3(59)	80 (72)	77.7(70)

Figures in parenthesis denote number of subjects.

Table 4.1.13 revealed that digestion problem was the commonest in all and highest in degree faced by the subjects irrespective of age and living arrangement, followed by chewing and swallowing.

Gilbridge et. al., (1998) in their study on 40 elderly subjects (women 35) reported that twenty subjects had problems with digestion, chewing and swallowing. These problems are usually faced by all elderly due to decrease in secretion of digestive juices and reduced capacity to digest along with physical and mental deprivations.

To understand the type of behavior for food and food related problems, data was also collected regarding the evening meal adjustments. Cooking problems were found especially in elderly who were cooking by themselves. Type of adjustments with the evening meals made by elderly women with different living arrangements is shown in the following table 4.1.14. Overall results showed that 88.3% of total subjects gave positive response, from these 93.3% belonged to women living alone group. No differences in the responses were found when compared within the same age group.

Table 4.1.14: Percentage of elderly subjects with different living arrangements and age groups showing different adjustments with evening meal

Sr. No.	Type of Adjustments	Living alone N=60	Living with spouse N=60	Living with family N=60	Young old n=90	Old old n=90	Total N=180
1	Use of leftover foods	63.3(38)	56.6(34)	73.3(44)	56.7(51)	72.2(65)	64.4(116)
2	Leftover with addition foods	75(45)	60(36)	75(45)	62.2(56)	77.8(70)	70(126)
3	Snacks/easy to make item	43.3(26)	46.6(28)	50(30)	51.1(46)	42.2(38)	46.6(84)
4	Partial fasting/ milk and fruit	11.1(7)	8.3(5)	10(6)	10(9)	10(9)	10(18)
5	Milk-Khakhara/ roti/ bread	8.3(5)	3(3)	11.1(7)	7.8(7)	8.9(8)	8.3(15)
6	Not applicable	6.6(4)	13.3(8)	13.3(8)	11.1(10)	11.1(10)	11.1(20)
7	Not Responded	00	00	1.1(1)	00	1.1(1)	1.1(1)

Figures in the parenthesis denote number of subjects.

The table 4.1.14 revealed that majority of subjects made adjustments and compromised with the evening meal. The commonest adjustment that was found in every group was the use of leftover foods alongwith addition of light item (70%), followed by only use of leftover food 64.4%, which was reported by more elderly women living with family and from old-old group. Other adjustments like preparing snacks / easy item were done by 46.6% subjects. With different living arrangements, slight differences were noticed in their adjustments for meals. Elderly women living alone always made adjustment with the food and its related activities. At certain age it becomes difficult to prepare full meals as cooking of more than one course involves lot of physical and mental activities. Even in a study carried out by Schlettwein (1991), where survey on dietary habits and attitudes among elderly belonging to European countries were carried out. Investigators found that subjects were making adjustments with evening meal by taking only soups and bread and leftover foods.

Data was also collected to find out reasons for the meal adjustments. The major reasons posed by the subjects for making adjustments were convenience (72.7%), digestion problem (10%) and difficulty in preparing food (9.4%).

To understand the type of eating habits, frequency of consumption of certain food items like food frequency of selected uncooked and cooked foods that require elaborate preparation was taken. Table (4.1.15 a) presents the frequency of uncooked food items by total subjects. Data on food frequency was collected with respect to selected uncooked food items such as raw fruits, milk and milk products, nuts and oilseeds and salads.

Table 4.1.15 (a): Percentage of elderly female subjects showing frequency of consumption of uncooked foods (N=180)

Uncooked food items	Daily	Frequently	Non-frequently
Fruits	39.4(71)	32.7(59)	27.7(50)
Milk	100(180)	----	-----
Milk Products	----	46.1(83)	53.8(97)
Nuts and Oilseeds	21.1(38)	15.5(28)	63.3(114)
Salads	33.3(60)	21.6(39)	55(99)

Figures in the parenthesis denote number of subjects.

Table 4.1.15 (a) projects four major classifications of uncooked foods. The highest daily consumption was observed for fruits (39.4%) followed by salad (33.3%) and nuts and oilseeds (21.1%) among all the elderly women. None of the subjects reported daily consumption of milk products. Under frequent category highest consumption was obtained for milk products (46.1%), followed by fruits (32.7%), salad (21.6%) and nuts and oilseeds (15.5%). Table 4.1.15 (b) gives an idea of frequency of uncooked food consumption among elderly women with different living arrangement and age groups.

Table 4.1.15 (b): Percentage of elderly women belonging to different living arrangements and age groups showing frequency of consumption of uncooked foods

Uncooked food items	Daily	Frequently	Non-frequently
Fruits			
Living alone (n=60)	33.3(20)	21.6(13)	45(27)
Living with spouse (n=60)	50(30)	38.3(23)	11.6(7)
Living with family(n=60)	35(21)	38.3(23)	26.6(16)
Young Old (n=90)	45.5(41)	28.8(26)	25.5(23)
Old -Old (n=90)	33.3(30)	36.6(33)	30(27)
Milk Products			
Living alone (n=60)	-----	28.3(17)	71.6(43)
Living with spouse (n=60)	-----	43.3(26)	55.4(34)
Living with family (n=60)	-----	66.6(40)	33.3(20)
Young Old (n=90)	-----	47.7(43)	52.2(47)
Old -Old (n=90)	-----	44.4(40)	55.5(50)
Nuts and Oilseeds			
Living alone (n=60)	10(6)	13.3(8)	76.6(46)
Living with spouse (n=60)	35(21)	21.6(13)	43.3(26)
Living with family (n=60)	18.3(11)	11.6(7)	70(42)
Young Old (n=90)	33.3(30)	21.1(19)	45.5(41)
Old -Old (n=90)	8.88(8)	10(9)	81.1(73)
Salads			
Living alone (n=60)	23.3(14)	23.3(14)	53.3(32)
Living with spouse (n=60)	45(27)	20(12)	35(21)
Living with family (n=60)	31.6(19)	21.6(13)	63.3(38)
Young Old (n=90)	45.5(41)	24.4(22)	30(27)
Old-Old (n=90)	21.1(19)	18.8(17)	60(54)

Figures in the parenthesis denote number of subjects.

In table 4.1.15 (b) frequency of raw foods is discussed in three categories namely, daily, frequently and non-frequently. When compared between the living arrangements it was found that women living with spouse scored highest for the daily consumption of fruits (50%), salad (31.6%) and nuts and oilseeds (35%) followed by

elderly women living with family and elderly women living alone with very slight differences between them. In Non-frequent category foods like nuts and oilseeds, salad and then fruits were noted. Age group wise distribution for frequency in consumption of raw foods showed that subjects belonging to young-old group consumed more fruits (45.5%) and salad (45.5%), compared to old-old group who only consumed half the percent of salad (21.1%) and 33.3% subjects consumed fruits daily. Very few elderly were found to consume nuts and oilseeds daily. Under the frequent category very less differences were observed between the age groups but when data on non-frequent category was assessed it was observed that consistently less percentage of raw foods were consumed by elderly women belonging to old-old group compared to young- old group. This may be related to digestion and chewing problems faced by elderly with different living arrangements and age groups (refer table 4.1.13).

While collecting data on frequency of cooked food items, especially those food items were selected that require elaborate preparation and consume more time for preparation. Table 4.1.16 shows the frequency of consumption of such elaborate food items.

Table 4.1.16: Percentage of elderly women belonging to different living arrangement and age groups showing frequency of consumption of foods that require elaborate preparation

Cooked Foods (Tuver, Undhiyu and seasonal varieties)	Women living alone in % (n=60)	Women living with spouse in % (n=60)	Women living with family in % (n=60)	Young-old in % (n=90)	Old-Old in % (n=90)
Daily	55(33)	61.6(37)	46.6(28)	50(45)	58.8(53)
Frequently	21.6(13)	16.6(10)	31.6(19)	34.4(31)	22.2(20)
Non- Frequently	23.3(14)	21.6(13)	21.6(13)	15.5(14)	18.8(17)

Figures in the parenthesis denote number of subjects.

Frequency of cooked foods consumption is presented in table (4.1.16). Daily consumption of foods that require elaborate preparation was more noted for elderly women living with spouse (61.6%), followed by elderly women living alone (55%) and elderly women living with family (46.6%). This was due to less time for pre-preparation and cooking required for less number of people whereas elderly women living with family where numbers of people are also more, required more time. Therefore elderly women living with family avoided food items, which involve more time in preparation. Different results were obtained when data was analyzed age group wise. Higher preference for daily food consumption that requires elaborate preparation was given by old-old group elderly women (58.8%) compared to young-old group (50%), as they were not going to cook such food items themselves.

Table 4.1.17, focuses on the amount of water intake by elderly women belonging to different categories.

Table 4.1.17: Percentage of elderly women with different living arrangements and age groups showing consumption of water per day

Amount of water Intake/day	Women living alone in % (n=60)	Living with spouse in % (n=60)	Living with family in % (n=60)	Young Old in % n=90	Old Old in % n=90
<6glasses	48.3(29)	48.3(29)	35(21)	36.7(33)	51.1(46)
6-8glasses	28.3(17)	36.6(22)	30.0(18)	33.3(30)	30.0(27)
>8glasses	23.3(14)	15.0(9)	35.0(21)	28.9(26)	20.0(18)

Figures in the parenthesis denote number of subjects.

With regard to living arrangements much less number of elderly could drink adequate amount of water. The lowest water intake was by elderly women living with spouse where only 15% elderly women could drink >8 glasses per day. In case of women living with family, highest percentage of subjects could drink >8 glasses per day because of availability of help from the family members. The data on normal water intake did not show much difference in younger group. About 37% subjects drank < 6 glasses /day, 33.3% subjects consumed 6-8 glasses/day and 28.9% of respondents

drank >8 glasses/day. In older group about 50% drank less than 6 glasses followed by 30% older women drank 6-8 glasses and 20% drank more than 8 glasses. The major reasons for avoiding drinking of water reported in other departmental studies were lack of thirst sensation and longer distance for reaching the source of water. This shows that as age increases the water intake decreases that could also be due to a feeling of tiredness and urinary incontinence. These studies carried out by Negi (2002) on 70 elderly men and Ray (2005) on 50 elderly female also showed low water intake by the elderly compared to the adults. Ray further reported that there was improvement found in the practices for water intake among elderly females after nutrition health education for two months.

When desire for need of assistance in all food related activities were asked, favorable responses were obtained. Highest positive response was obtained from 53.3% of elderly women who where living alone, followed by 48.3% women living with family and 46.6% of women living with spouse. Remaining subjects did not feel the need of assistance or only needed at certain occasions (15.6% in young and 18.9% in old group), 51.1% subjects from younger group and 47.8% subjects from older group gave positive response. Around 14.4% subjects did not like outsiders working in their house, 13.8% subjects felt servants should not work in the kitchen and 2.7% subjects showed financial constraints. With deteriorating health status and feeling of work pressure in the kitchen, women living alone and women who were slightly active (young old) showed desire for help in food related activities.

Jamuna (1995), in her study concluded that there is tendency for elderly wives of retired men to continue to bear much of the responsibilities for carrying out routine tasks, which prevented them from enjoying equivalent leisure in retirement age.

Acceptance to readymade wholesome food was given by 61.1% of elderly women irrespective of their living arrangement whereas among young old elderly 85.6% readily agreed for readymade foods compared to 56.7% old- old elderly. Remaining 44.44% rejected the idea of getting ready-made foods along with older group because the taste and type of readymade foods available were not acceptable to them. As one of the participants reported: " I don't know how they are manufactured or what they are putting into it ...I'd rather buy fresh food and cook it myself. Some of these

prepared meals, I don't know who and how they cooks them so I don't see the point in buying them". McKie et. al., (2000), studied 150 elderly people above 75 years of age. They surveyed the food consumption pattern and perceptions of dietary advice of older people and found that dietary beliefs were firmly rooted in childhood and lifetime experiences, make them impossible to change.

Out of those elderly women who gave positive response for ready-made food were also asked whether they could buy and how much amount they could spend for buying a meal in a day. The data revealed that 29.4% women could spend more than Rs.30/-, out of which 41.6% belonged to group-3, 25% were from group-2 and 21.6% were from group-1. Higher number was reported from group-2 for spending between Rs.15-30/-, where as older women from group-1 and group-3 was 20% and 16.6 % respectively. Very few elderly opted for spending Rs.15/- (11.1%). Age group wise results showed that more number of young-old elderly (34.4% for >Rs.30, 22.2% for Rs.15-30 and 8.9% for <Rs.15 were eager to spend compared to old-old elderly (24.4% for >Rs.30, 18.9% for Rs.15-30 and 13.3% for <Rs.15). The above data suggests that there is a need to bring awareness and behavioral change among such elderly women. With advances in food technology elderly should try to change life style to suit their age and health.

(a-ii) Dietary intake: -

Data on dietary intake was obtained using 24-hour dietary recall method. Table 4.1.18 shows mean nutrient intake of the elderly women with different living arrangements and age groups. While comparing mean nutrient intake with RDA, the data given in the table 4.1.18 showed that elderly women living alone had low intake of energy, where as elderly women living with spouse and family could satisfy the RDA. When energy intake was compared between the groups it was found statistically significant ($p<0.001$). In case of protein, intake was low compared to RDA in all the groups and it was statistically significant ($p<0.001$) between the groups also. Except fat and calcium consumption of other nutrients were also found low in intake as compared to RDA. Similar results were found when comparisons were made between the age groups. Younger elderly were consuming significantly higher amounts of nutrients as compared to older elderly women in terms of energy, protein, calcium and iron ($p<0.001$).

Table 4.1.18: Mean nutrient intake of the elderly women with different living arrangements and age groups (mean ± SD)

NUTRIENTS	RDA	LIVING ALONE N=60	LIVING WITH SPOUSE N=60	LIVING WITH FAMILY N=60	F-TEST	YOUNG OLD (n=90)	OLD OLD (n=90)	F-TEST
Energy (kcal)	1350	1250±356	1467±402	1494±383	7.29*	1475±303	1235±378	6.29*
Protein (gm)	50	34.9±10.7	39.5±9.09	41.98±9.57	7.41*	47.9±12.4	36.5±9.90	7.49*
Fat (gm)	20	71.1±23	45.1±15.7	50.6±18.26	0.79	71.5±26	68.1±24.7	0.79
Calcium (mg)	400	540.8±233	607.5±190	593.8±194	1.70	640.8±173	446.5±130	8.70*
Iron (mg)	28	14.3±9.4	17.5±9.3	15.0±7.57	2.20	21.3±6.4	14.5±5.3	2.20
β-Carotene (μg)	2400	1159±111	1010±85.4	1166±94.1	0.82	1269±179	910±86.4	6.82*
Vit- C (mg)	40	23.45±2.4	29.28±2.3	28.5±3.5	1.08	32.49±2.9	26.20±2.9	1.08

*P ≤ 0.001

RDA: Source suggested by Natarajan, 1999.

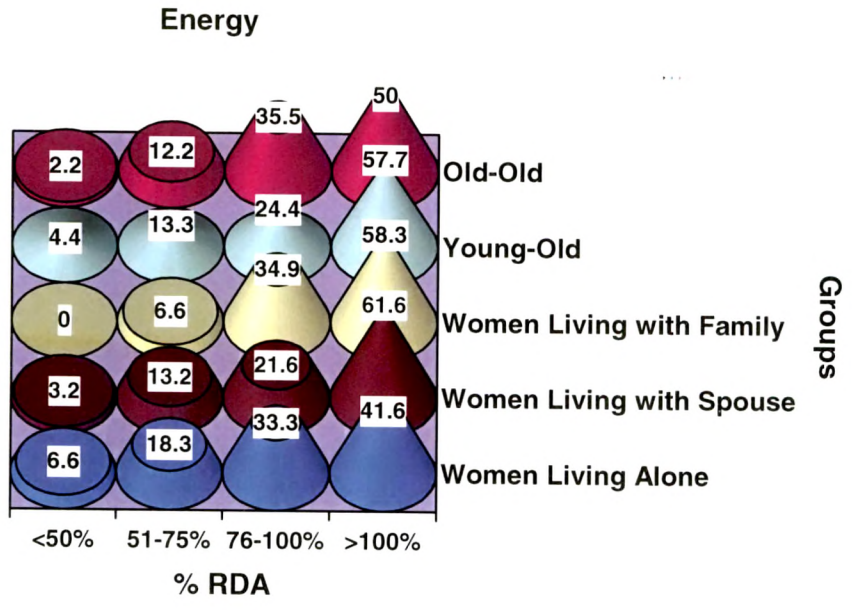
Nutritional inadequacy in elderly population was consistently found in many studies carried out on local population (Mehta and Vasavda, 2003 and Mehta and Shrigarpure, 2000). In a study by Lahmann and Kumanyika,(1999) carried out a study on elderly aged 65-75 years and reported lower intake of energy, calcium and iron in the diet.

According to remark made by Dr. Kalyan Bagchi (1997), president, Help age India, the reasons for nutritional inadequacy in elderly females is adoption of inappropriate dietary practices mainly due to economic and social deprivation.

If we look at the data on consumption of fruits and vegetables and problems related to food activities at each stage, elderly women living alone and with spouse are adversely affected. Higher intakes were found in women living with families. More compromises were made in food habits by elderly living alone because of lack of help resulting in poor nutritional status.

Figure 4.1.3 (a and b) shows the percent subjects consuming nutrients as percent RDA by elderly women.

Figure 4.1.3 (a): Percentage of elderly women with different living arrangements and age groups showing consumption of energy and protein as percent RDA



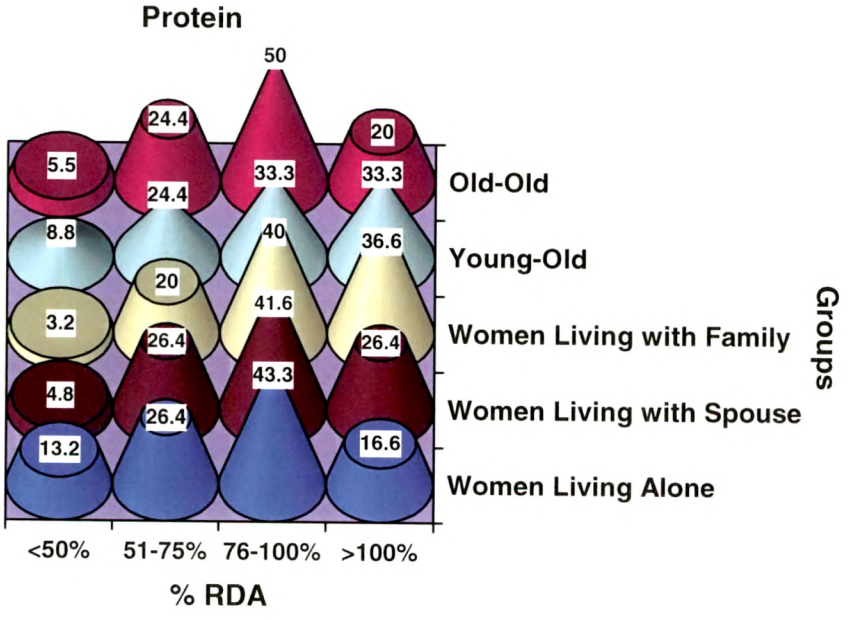
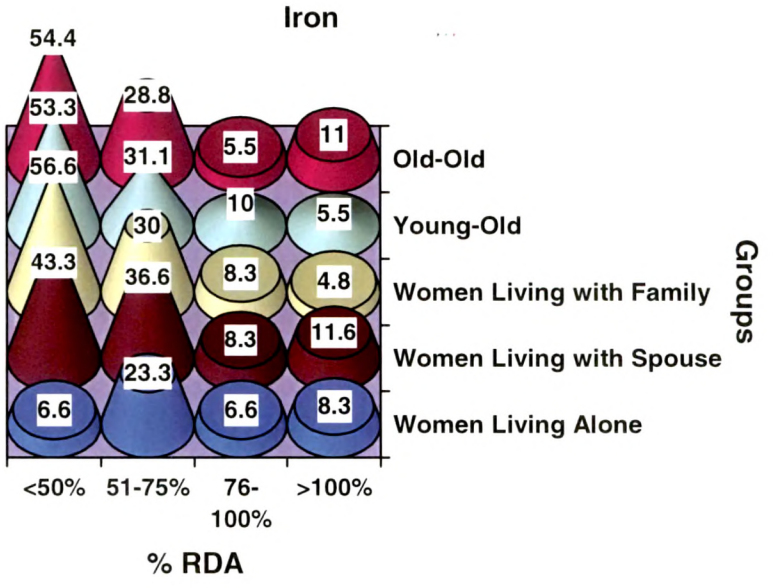
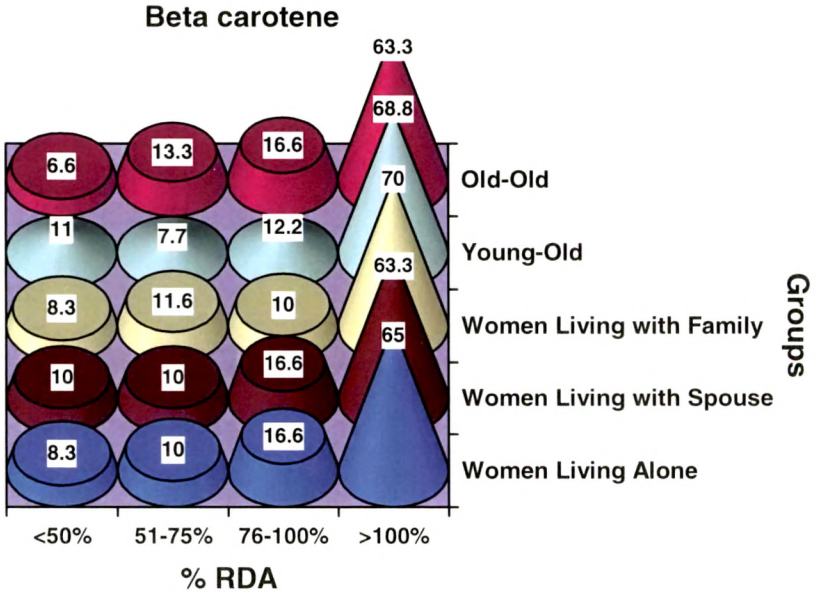


Figure 4.1.3 (b): Percentage of elderly women with different living arrangements and age groups showing consumption of iron and beta carotene intake as percent RDA





(b) Nutritional status: -

(i) Anthropometric measurements: -

Data on anthropometric measurement was collected by measuring height, weight, BMI and MUAC.

Table 4.1.19 depicts the mean anthropometric measurements of the elderly women with different living arrangements and age groups.

Table 4.1.19: Mean anthropometric measurements of elderly women with different living arrangements and age groups (mean ± SD)

INDICES	Women living alone (n=60)	Women living with spouse (n=60)	Women living with family (n=60)	Young-Old (n=90)	Old-Old (n=90)
HEIGHT (M)	1.52±0.36	1.51±0.13	1.52±0.75	1.52±0.40	1.51±0.63
WEIGHT (KG)	56.03±1.1	57.38±3.56	57.35±3.69	60.68±14.14	53.13±11.46
BMI (KG / M^2)	24.00±4.32	25.88±11.22	24.40±5.38	26.6±9.34	22.9±4.74
MUAC (CM)	26.36±5.92	28.46±10.8	26.40±6.08	26.71±6.6	22.69±4.76

The mean antropometric measurements showed that all the subjects were falling in the healthy category. When subjects from young old group were assessed, it was found that mean weight (60.6kg) and BMI (26.6kg/m2) values were falling on the higher side than the desired values. No such differences were observed in older elderly women. Data of women with different living arrangements showed that elderly women living with spouse showed higher weight and BMI values.

Table 4.1.20 shows the percent prevalence of weight distribution among elderly subjects with different living arrangements and age groups.

Table 4.1.20: Percentage of subjects with different living arrangements and age groups showing prevalence of weight distribution

Categories	Women living alone (n=60)	Women Living with spouse (n=60)	Women Living with family (n=60)	Young old (n=90)	Old-old (n=90)
Under weight	23.3 (14)	20 (12)	20 (12)	16.6 (15)	34.4 (31)
Healthy	40 (24)	51.6 (31)	50 (30)	50 (45)	41.1 (37)
Overweight	30 (18)	28.3 (17)	30 (18)	33.3 (30)	24.4 (22)

Figures in the parenthesis denote number of subjects.

Table 4.1.20 reveals that though majority of elderly women were found in the healthy category, as per their weight distribution, around 20-23% of women belonging to different living arrangements were found in under weight category. When compared age wise, 16.6% subjects from young old and double the number than that in older group subjects were found under weight. Twenty eight to 33% of elderly were found overweight with highest number in young-old group of subjects.

(c) Clinical parameters:-

(i) Hemoglobin levels: -

Table 4.1.21 shows the mean hemoglobin levels of the elderly women with different living arrangements and age groups.

Table 4.1.21: Mean hemoglobin values of the elderly women with different living arrangements and age groups (mean ± SD)

	Living alone (n=60)	Living with spouse (n=60)	Living with family (n=60)	Young-Old (n=90)	Old-Old (n=90)
Haemoglobin gm/dl	10.75±2.43	11.08±2.49	11.44±1.85	11.52±1.60	10.14±2.46

Normal cut off value: 12gm/dl

The mean hemoglobin values of the elderly subjects with three different living arrangements and age groups (table 4.1.21) fell between 10.14 and 11.52 gm/dl, showing the category of mild anemia. Women living alone and especially women from the older group were found to have nutritional anemia of greater severity compared to other three groups.

It could be noted here that more problems were faced by women living alone in both the age groups and especially in older group in carrying out the food related and physical activities as compared to other groups. It may be noted that minor illnesses like bodyache, headache and general weakness were also found higher in these age groups (refer table 4.1.25). Such conditions lead to feeling of compromise in activity like cooking meals. Thus, need for easy to cook and digest food, which could provide good nutrition to such elderly people is strongly indicated.

The percent prevalence of mild, moderate and severe anemia assessed by their hemoglobin levels in all the subjects is shown in table 4.1.22 (a) and among different categories is shown in table 4.1.22 (b) and figure 4.1.4.

Figure 4.1.4: Percent prevalence of anemia among elderly women

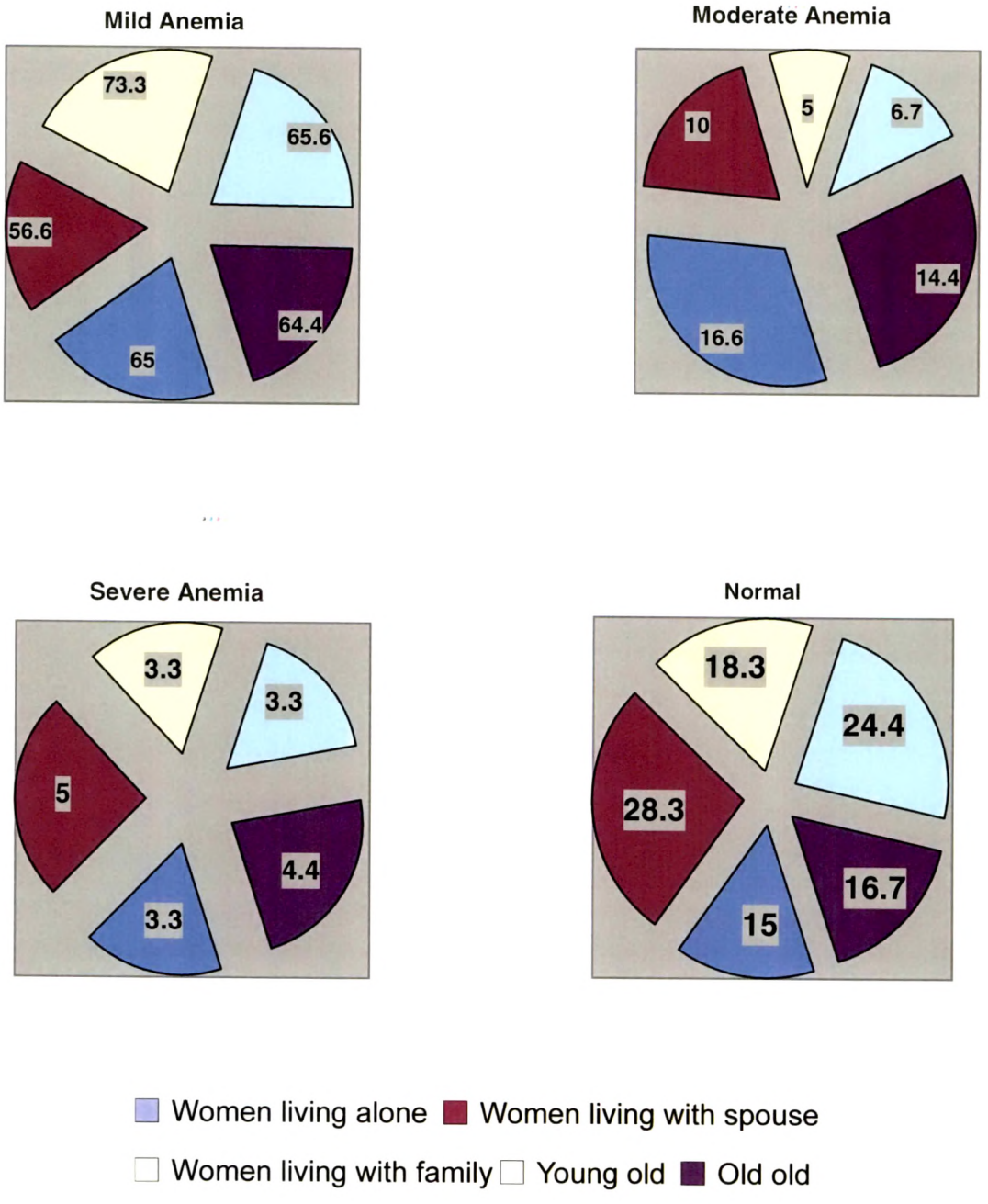


Table 4.1.22 (a): Percent subjects showing prevalence of anemia

Degree of anemia	Hemoglobin levels (gm/dl)	Percent prevalence N=180
Severe	≤ 7	3.8 (7)
Moderate	7.1 – 9.9	10.55 (19)
Mild	10 – 11.9	65 (117)
Normal	≥ 12	20.5 (37)

Figures in the parenthesis denote number of subjects.

Table 4.1.22 (b): Percent prevalence of anemia in elderly subjects with different living arrangements and age groups

Degree of Anemia	Hemoglobin levels (gm/dl)	Women living alone (n=60)	Women living with spouse (n=60)	Women living with family (n=60)	Young-Old (n=90)	Old-Old (n=90)
Severe	≤ 7	3.3 (2)	5.0 (3)	3.3 (2)	3.3 (3)	4.4 (4)
Moderate	7.1 – 9.9	16.6 (10)	10.0 (6)	5.0 (3)	6.7 (6)	14.4 (13)
Mild	10 – 11.9	65.0 (39)	56.6 (34)	73.3 (44)	65.6 (59)	64.4 (58)
Normal	≥12	15 (9)	28.3 (17)	18.3 (11)	24.4 (22)	16.7 (15)

Figures in the parenthesis denote number of subjects.

The above table 4.1.22 (a and b) and figure 4.1.4 clearly shows that most of the elderly women were anemic (most of with mild category) and around 20% of subjects were non anemic. Percentage of anemia (even moderate and severe cases) was higher in elderly women living alone compared to any other groups.

Highest number (73.3%) of women were found to have mild degree of anemia from a group living with their family, followed by women living alone (65%) and women living with spouse (56%). Seventeen percent of subjects from a group of women living alone, 10% from women living with spouse and 5% from women with family were found in the moderate category of anemia. Different results were obtained when subjects with different age groups were compared. Majority of subjects in young old

group were suffering from mild anemia (65.6%). whereas 6.7% of the subjects were found moderately anemic and only 3.3% were falling in the category of severe anemia. In case of older elderly 64.4% women were suffering from mild anemia, 14.4% were moderately anemic, 4.4% with severely anemic and 16.7% subjects were found in the normal category. Very few subjects in all (<5%) were found in severe category of anemia. Therefore in all maximum number of elderly women suffering from anemia were found from a group of women living alone. This shows poor health and nutritional status of the subjects. Decrease in hemoglobin levels are generally attributed with low food intake rich in iron along with the deficiency of factors affecting the iron absorption in the body.

Russell (2001), studied factors affecting the bioavailability of nutrients in elderly and found that atrophic gastritis also decreases the iron and calcium bioavailability.

A study carried out by Patel (1999) in the Department of Foods and Nutrition, M.S.University of Baroda, Vadodara, on pre-geriatric and geriatric women in relation to osteoporotic fractures found that 61% of elderly women were suffering from anemia as compared to 45% of adult women.

(ii) Blood glucose estimation: -

The table 4.1.23 shows the mean blood glucose values and percentage of the elderly women with different age groups and living arrangements.

Table 4.1.23: Mean blood glucose values and percentage of normal and abnormal blood glucose levels of the elderly women with different living arrangements and age group (mean ± SE)

	Women living alone n=60	Women living with spouse n=60	Women living with family n=60	Young old n=90	Old old n=90
Mean blood glucose mg / dl	97.8±4.2	106.6±5.2	105.5±4.0	107.7±8.6	94.1±6.7
Normal levels	65 (39)	73.3 (44)	66.6 (40)	65.5 (59)	56.6 (51)
Abnormal levels	35 (21)	26.6 (16)	33.3 (20)	34.4 (31)	43.3 (39)

Figures in the parenthesis denote number of subjects.

The mean blood glucose levels of the elderly women shown in the table 4.1.23 depicts that all the values fall under the normal ranges. When compared between the groups it was found that women living alone and women from older age had lower values. These finding again showed the vulnerability of these groups of elderly women. Twenty six to 35% and 34 to 43% subjects were found with abnormal blood glucose levels among women with different living arrangements and age group respectively.

(iii) Blood pressure measurement: -

Table 4.1.24 shows the mean blood pressure values and percentage of normal and abnormal levels of the elderly women with different living arrangements and age groups.

Table 4.1.24: Mean blood pressure values and percentage of normal and abnormal levels of the elderly women with different living arrangements and age group (mean ± SD)

Blood pressure mm / Hg	Women living alone n=60 (%)	Women living with spouse n=60 (%)	Women living with family n=60 (%)	Young old n=90 (%)	Od old n=90 (%)
*SYSTOLIC	160±16	158±14	152±14	152±14	160±16
*DIASTOLIC	90±10	90±10	80±8	80±8	90±10
#Normal levels	56.6 (34)	53.3 (32)	66.6 (40)	72.2 (65)	76.6 (69)
#Abnormal levels	43.3 (26)	46.6 (28)	33.3 (20)	27.7 (25)	23.3 (21)

***Mean ± SD, Figures in the parenthesis denote number of subjects.**

 # Normal= ≤140/90mmHg (JNC - III Classification)

When mean blood pressure values were compared with normal values as shown in table 4.1.24, it revealed that elderly women living alone, living with spouse and from older age group had systolic blood pressure on the higher side compared to the desired range. This findings showed that as age increases there are chances of increase in blood pressure levels and may be elderly women living alone and with spouse had more work pressure than the elderly women living with family. Abnormal blood pressure levels were found higher (46.6%) in women living with spouse followed by women living alone and with family. With regard to age majority of elderly were found with normal blood pressure measurements.

(d) General health profile: -

Data was collected on self perceived health and general health conditions of the elderly women. Approximately the data on perceived health by the subjects showed following responses. When compared between the living arrangements again elderly women living alone (58.3%), women living with spouse (68.3%) and (1.6%) women living with family believed themselves as all right for age. In case of younger group

63.3% whereas in older group around 62.2% women felt the same. Gustafesson et al., (1998) concluded that those elderly who perceived their health as fairly or very bad were more likely to die than those who considered their health to be good or fairly good.

More that 70% elderly women reported of sound sleep except a few among older and living with children found of having disturbed sleep. Sleeping disorders were reported more often by elderly women (20 to 30%) than by men (5 to 15%) as reported by Wahlqvist et. al., (1995). Normal vision was reported by 40% young and 42% older elderly and more in number by women living alone (50%) subjects. Out of all groups approximately 15% in each category reported presence of cataract, around 17% to 20% reported of surgery for cataract where older women was on higher number. Very few elderly women used to wear spectacles i.e. 12.1% young elderly and 6.7% old elderly. However more number of elderly i.e. 41% & 30% in young and old were prescribed glasses respectively. Same types of results were observed in women with different living arrangements. Regarding ear function more than 91% in young elderly and older 72% women reported of normal hearing ability. Very, few elderly were found using hearing aid i.e., 2.2% in younger elderly women and 3.3% in older elderly women. Among women with different living arrangements, all women faced equal number of problem. No abnormality regarding taste and smell sensation was observed where about 97% were reported with normal taste sensation and 100% smell sensation in all groups.

With respect to walking 92.2% young elderly and 70% old elderly, 71.6% from women living alone, 76.6% from women living with spouse and 80% from women living with family were able to walk normally followed by 13.3% from subjects living alone,18.3% from women living with spouse and 15% from women living with family and majority among these older elderly (18.9%) were unable to walk, whereas support of stick was reported more in older group to about 8.9%

Expenditure on medical treatment of the subjects was mainly taken care by themselves i.e., 66.6% subjects were from living alone and living with spouse and

only 25% belong to women living with family. With regard to age group 48.39% young and 34.4% older elderly used to spend for their medical expenses.

Results of the health profile described, that as age increases problems increase. All the sensory organs were found to be deteriorating with increase in age irrespective of living arrangement. There were no significant differences found. It was observed, that women living alone and women living with spouse were dependent on some or the other aid to carry out the normal routine activities, suggesting need of the assistance to lead healthy life.

As far as medical expenses were concerned younger group and among them subjects living alone and with spouse were independent compared to subjects living with family and older elderly women where sons took care of the finances.

(e) Disease profile: -

Checklist of common minor and major illnesses found in elderly women with age groups and different living arrangement was prepared. Depending upon the influence of work pressure and age factor, the frequencies of listed illnesses were recorded.

Table 4.1.25 presents the frequency of minor illnesses as reported by elderly from different age groups and with different living arrangements.

Table 4.1.25: Percentage of elderly women with different living arrangements and age groups showing self perceived minor health problems occurring frequently using checklist

Sr. No.	Minor Illnesses	WLA (n=60) Frequency (%)	WLS (n=60) Frequency (%)	WLF (n=60) Frequency (%)	YO (n=90) Frequency (%)	OO (n=90) Frequency (%)
1.	Dental problems	35 (21)	41.6 (25)	31.6 (19)	28.9(26)	43.3 (39)
2.	Nausea	3.3 (2)	00	6.6 (4)	2.2(2)	4.4 (4)
3.	Vomiting	3.3 (2)	1.6 (1)	3.3 (2)	2.2 (2)	3.3 (3)
4.	Burning of	8.3 (5)	5 (3)	8.3 (5)	5.5 (5)	10 (9)

	chest					
5.	Distention	21.6 (13)	10 (6)	21.6 (13)	15.6 (14)	20 (18)
6.	Flatulence	5 (3)	1.6 (1)	11.6 (7)	6.8 (6)	3.3 (3)
7.	Abdominal pain	1.6 (1)	00	5 (3)	2.2 (2)	2.2 (2)
8.	Diarrhoea	8.3 (5)	6.6 (4)	3.3 (2)	5.6 (5)	6.7 (6)
9.	Dysentery	3.3 (2)	5 (3)	00	3.3 (3)	2.2 (2)
10.	Constipation	35 (21)	21.6 (13)	21.6 (13)	14.4 (13)	37.8 (34)
11.	Recurrent cold	16.6 (10)	6.6 (4)	20 (12)	14.4 (13)	14.4 (13)
12.	Irritating cough	20 (12)	8.3 (5)	18.3 (11)	14.4 (13)	16.7 (15)
13.	Pain in swallowing	13.3 (8)	3.3 (2)	8.3 (5)	5.6 (5)	11.1 (10)
14.	Chest pain	8.3 (5)	1.6 (1)	1.6 (1)	1.1 (1)	6.7 (6)
15.	Pneumonia	1.6 (1)	00	1.6 (1)	00	2.2 (2)
16.	UTI	6.6 (4)	5 (3)	8.3 (5)	6.7 (6)	6.7 (6)
17.	Headache	23.3 (14)	16.6 (10)	15 (9)	14.4 (13)	22.2(20)
18.	Body ache	28.3 (17)	26.6 (16)	30 (18)	25.6 (23)	31.1 (28)
19.	Slow reflexes	18.3 (11)	26.6 (16)	8.3 (5)	16.7 (15)	18.9 (17)
20.	General weakness	31.6 (19)	25 (15)	20 (12)	23.3 (21)	30 (27)
21.	Dryness of skin	35 (21)	38.3 (23)	35 (21)	35.6(32)	36.7(33)
22.	Trembling of limbs	21.6 (13)	10 (6)	10 (6)	89 (80)	20 (18)

Figures in the parenthesis denote number of subjects.

WLA: Women living alone, WLS: Women living with spouse, WLF: Women living with family, YO: Young old women, OO: Old-old women.

Table 4.1.25 reports the frequency of occurrence of minor illnesses among elderly women with different living arrangements and age groups.

When we compare the minor health problems of elderly women with respect to the living arrangements we could find that frequency of headache (23.3%), body ache (28.3%) and overall general weakness (37%) was more in women living alone

followed by women living with spouse and family. This shows the vulnerability of the group and need of attention on their health status. With regard to living arrangements lack of help in carrying out various activities must be deteriorating the conditions of elderly women living alone.

Zunzunegui et. al., (2001), studied a support of children on health of older people and found that co-residence with children is very common in Spain and it is associated with good self-perceived health and low prevalence of depressive symptoms among elderly in a culture where family interdependence is highly valued.

The most frequent minor illnesses prevalent among the younger elderly were dryness of the skin (35.6%), dental problems (28.9%), general weakness (23.3), body ache (25.6%), constipation, cough and cold 14.4% each respectively. In older elderly apart from the illnesses mentioned for younger group other illnesses reported in them were dental problems 43.3% and stomach distention (20%). These findings are similar to the findings of the studies on local elderly population of Vadodara city. The findings of these studies showed that oral cavity problems, central nervous system disorder and gastro intestinal disorders were more prevalent among elderly (Mehta and Shrigarpure, 2000 and Mehta et. al, 1997).

Problems occurring with increase in age like trembling of limbs (20%) and slow reflexes (19%) were more observed in older elderly. More than 30% of the subjects had dental problems in all the groups. Therefore from the given table (4.1.25) it is easy to understand that when two age groups are compared for frequency of minor illnesses, older elderly suffered more than the younger elderly subjects. This is attributed to the fact that, as age advances the morbidities increase and functional capacity decreases.

Shringarpure (2004) studied 166 men and 70 women aged 45 years and above and it was found that gastrointestinal problems were rated highest among elderly men and oral cavity problems was found higher in both the groups.

Sahu et. al., (2003) studied 124 elderly (60 yrs and above) from urban slums for their functional status using different instruments. It was found that one or more functional

impairments were found in 94.3% of elderly. They further found that the major causes of impairments were malnutrition (62.9%), depression (45.9%) and impaired vision (42.7%). They concluded that female elderly were significantly ($p<0.05$) more affected than elderly male. Major health problems are reported in the given below table 4.1.26.

Table 4.1.26: Percentage of elderly with different living arrangements and age groups showing presence of major illnesses

Sr. No.	Major Illnesses	WLA (n=60) %	WLS (n=60) %	WLF (n=60) %	YO (n=90) %	OO (n=90) %
1.	Duodenal Ulcer	1.6 (1)	1.6 (1)	00	2.2 (2)	00
2.	Liver Disease	1.6 (1)	1.6 (1)	00	2.2 (2)	00
3.	Diabetes Mellitus	15 (9)	20 (12)	18.3 (11)	20 (18)	15.6 (14)
4.	Tuberculosis	1.6 (1)	1.6 (1)	1.6 (1)	2.2 (2)	1.1 (1)
5.	Asthma	15 (9)	5 (3)	6.6 (4)	5.6 (5)	12.2 (11)
6.	Ischemic heart Disease	15 (9)	10 (6)	10 (6)	10 (9)	13.3 (12)
7.	Hyperlipidemia	8.3 (5)	1.6 (1)	1.6 (1)	4.4 (4)	3.3 (3)
8.	Hypertension	33.3 (20)	20 (12)	28.3 (17)	23.3 (21)	31.1 (28)
9.	**Osteoarthritis**	35 (21)	**40 (24)**	28.3 (17)	**41.1 (37)**	**27.8 (25)**
10.	Gynec. Problem	11.6 (7)	5 (3)	5 (3)	7.8 (7)	6.7 (6)
11.	Convulsive attacks	00	00	00	00	00
12	Any disability	11.6 (11)	10 (6)	5 (3)	10 (9)	7.8 (7)

Figures in the parenthesis denote number of subjects.

WLA: Women living alone, WLS: Women living with spouse, WLF: Women living with family, YO: Young old women, OO: Old-old women. (Data obtained from medical records).

The table 4.1.26 revealed that some of the problems especially diabetes (20%) and arthritis (41.1%) were more found in younger elderly women compared to older group whereas in older group hypertension (31.1%) and asthma (12.2%) were seen in higher percentage. Walhqvist et. al., (1995) studied 275 elderly men and 345 elderly

women. They study that arthritis, hypertension, heart trouble, diabetes and stroke were disorders most commonly reported in the elderly communities. They even further reported that women were more likely to report hypertension compared to men, especially Greeks and Filipinos. Very few elderly reported of having heart problems (10% in young Old and 13.3% in Old- Old elderly), where as in a study carried out in Sweden on 250 elderly by Gustafsson et. al., (1998) reported that about 35% of subjects were suffering from heart problems.

Women living with spouse followed by women living alone and women living with family focus more problems. Hypertension was the only problem, which was affecting more than 20% of the subjects in all the groups.

A study carried out by Mehta and Mehta (2003) on 150 elderly from Hindu, Jain and Muslim community revealed that prevalence of cardio vascular problems was highest among Muslim elderly subjects (44%). Patel (1999) studied 100 men and women in the age group of 50-60 years and 45 elderly above 60 years of age in relation to osteoporotic fractures. Their disease profile revealed that GIT and CVD problems were found more prevalent among elderly subjects as compared to pre geriatric group of subjects.

Chronic geriatric diseases, physical and psychological disabilities and poverty are among the risk factors for older people developing malnutrition. Preventing this condition in at-risk groups can be over come by providing home-delivered meals and assisting with food shopping and cooking, particularly for those who are confined to their own homes within the community. It is also important that vigilance is maintained with regard to feeding practices in nursing homes (www.fsai.ie). Thus from the findings of the above study it can be summarized that elderly women living alone older group women (aged >75 years) suffered the most with respect to food related activities, diet and nutritional status. It is to be noted that women living alone were having higher number of elderly between the age 70-80yrs. These aspects lead to overall poor health among them.

PHASE II:

IMPACT OF IRON FOLIC ACID SUPPLEMENTATION ON HEALTH OF ELDERLY ANEMIC WOMEN FOR A PERIOD OF SIX WEEKS.

Data was collected on health and nutritional status of elderly women with different living arrangements and age groups as a part of survey in phase I. Results of assessment of hemoglobin levels among elderly women showed that around 80% subjects were having hemoglobin levels of <12gm/dl. When this was further categorized it was found that 65% of subjects had mild degree of anemia, 10.5% subjects were falling in the moderate category of anemia and remaining 3.8% subjects had severe anemia. Disease profile of these elderly women showed poor health status. Ultimately these conditions of the elderly lead them to compromise with food intake, which adversely affected their nutritional status and poor quality of life. Therefore it was thought worthwhile to study health of such elderly anemic women after giving supplementation of Iron Folic Acid tablets for a period of six weeks.

The specific objectives of the study were: 1) To select anemic elderly women and to study the impact of Iron Folic Acid (IFA) tablets for a period of six weeks. 2) To collect pre and post data on dietary intake, hemoglobin levels, physical performance and cognitive performance of the elderly anemic women.

Forty-five elderly anemic women with hemoglobin < 12gm / dl from phase –I, were selected for the supplementation of Iron folic acid tablet for a period of six weeks. IFA tablet was distributed on daily basis. Iron folic acid tablets (IFA) in appropriate doses were given to the experimental group for a period of six weeks. Pre and post hemoglobin levels and minor complaints were compared. Out of 45 subjects who were given intervention, only 30 subjects were ready to perform physical performance and cognitive function tests. Their age and hemoglobin matched subjects were chosen as their control group. Therefore results for physical performance and cognitive functions are presented for 30 subjects separately.

The results of the study are presented below under the following headings:

1. DIETARY INTAKE
2. HEMOGLOBIN LEVELS
3. PHYSICAL PERFORMANCE TESTS
4. COGNITIVE FUNCTIONS TESTS

1. DIETARY INTAKE

Data on food intake was collected using 24-hour dietary recall method. Mean nutrient intake of both the groups is shown in table 4.2.1.

Table 4.2.1: Mean nutrient intake of the elderly anemic subjects in two groups before IFA supplementation (Mean ± SD)

Sr. No.	Nutrients	RDA	Group with IFA supplementation n = 45	Group without IFA supplementation n = 30
1.	Energy (Kcal)	1350	1130 ± 330.12	1313 ± 355
2.	Protein (gm)	50	35.52 ± 10.97	39.03 ± 7.27
3.	Fat (gm)	20	40.53 ± 17.91	46.96 ± 13.91
4.	Calcium (mg)	400	535.10 ± 222.56	716.86 ± 210.11
5.	Iron (mg)	28	15.38 ± 9.65	16.03 ± 10.55
6.	β carotene (μg)	2400	950.89 ± 588.76	1023.56 ± 23.03
7.	Vitamin C (mg)	40	25.10 ± 16.10	26.70 ± 21.03

Source of RDA: Natarajan, 1991.

The data on mean nutrient intake of anemic elderly subjects (table 4.2.1) revealed that diets were deficient in energy, protein, iron, β carotene and vitamin C as compared to that of recommended dietary allowances (Natarajan, 1991) in both the groups except fat and calcium. A study was conducted by Shah A (2006) on depressed elderly women showed deficient intake of protein, iron and β carotene and nutrients like selenium, zinc and vitamin B_6 which are known to be brain tonics. Also a

study carried out by Patel (2003) on institutionalized elderly subjects reported that energy, protein, iron and β -carotene were consumed less than RDA.

Table 4.2.2 shows the mean nutrient intake of the experimental and control group before and after IFA supplementation. There was a significant rise in the energy intake ($p<0.05$) of the experimental group subjects. Increase in intake of other nutrients was not significant. In case of control group subjects there was hardly any improvements found.

Table 4.2.2: Mean nutrient intake of elderly anemic women before and after IFA supplementation for 6 weeks (Mean + SD)

Sr. No.	Nutrients	Experimental group (before intervention) n=45	Experimental group (after intervention) n=45	't' Value	Control group (before intervention) n = 30	Control group (after intervention) n = 30	't' Value
1.	Energy (Kcal)	1130 ± 330.12	1190 ± 325.56	2.65*	313 ± 355	1336 ± 349	0.67
2.	Protein (gm)	35.52 ±10.97	36.11 ± 9.20	0.39	39.03 ± 7.27	38.6 ± 7.94	-0.23
3.	Fat (gm)	40.53 ±17.91	45.03 ± 15.34	1.46	46.96 ± 13.91	48.65 ± 11.23	0.68
4.	Calcium (mg)	535.10 ± 222.56	579.54 ± 201.66	0.76	716.8 ± 210.11	698 ±168	-0.34
5.	Iron (mg)	15.38 ± 9.65	16.78 ± 8.97	0.55	16.03 ± 10.55	15.90 ± 9.78	-0.25
6.	β carotene (μg)	950.89 ± 588.76	1150.87 ± 845.21	1.63	1023.5 ±23.03	1090 ± 432	1.23
7.	Vitamin C (mg)	25.10 ± 16.10	30. 53 ± 25.46	1.23	26.70 ± 21.03	26.89 ± 15.9	0.23

* Significant at P<0.05

Percentage of elderly anemic women showing nutrient intake as percent RDA before and after intervention with IFA is shown in table 4.2.3.

Table 4.2.3: Percentage of elderly anemic women with IFA supplementation showing nutrient intake as percent RDA before and after intervention (n=45)

		Before Intervention % of RDA met				After Intervention % of RDA met			
SR. NO.	**NUTRIENTS**	**≤50 %**	**51 – 75%**	**76 – 100 %**	**>100 %**	**≤50%**	**51 - 75**	**76 – 100%**	**>100 %**
1.	Energy (Kcal)	8.8 (4)	33.3 (15)	46.6 (21)	11.1 (5)	8.8 (4)	22.2 (10)	60 (27)	8.8 (4)
2.	Protein (gm)	22.2 (10)	57.7 (26)	20 (9)	00 (0)	15.5 (7)	57.7 (26)	26.6 (12)	00 (0)
3.	Fat (gm)	---	---	---	100 (45)	---	---	---	100 (45)
4.	Fiber (gm)	64.4 (29)	35.5 (16)	---	---	64.4 (29)	35.5 (16)	---	---
5.	Calcium (mg)	---	---	55.5 (25)	44.4 (20)	---	---	46.6 (21)	53.3 (24)
6.	Iron (mg)	57.7 (26)	20 (9)	22.2 (10)	---	51.1 (23)	26.6 (12)	22.2 (10)	---
7.	β-carotene (µg)	100 (45)	---	---	---	97.7 (44)	2.2 (1)	---	---
8.	Vitamin-C (mg)	13.3 (6)	31.1 (14)	53.3 (24)	2.2 (1)	8.8 (4)	26.6 (12)	60 (27)	4.4 (2)

Figures in the parenthesis denote number of subjects.

Comparison of nutrient intake with regard to percent RDA reported that 46.6% of subjects were consuming energy between 76-100% of RDA before intervention showed improvement and 60% subjects could fulfill 76-100% of RDA after intervention. With respect to protein, 6.6% subjects showed increase in intake and could fulfill 76-100% of RDA. Similarly slight improvements in intake of iron and vitamin C was observed when compared with RDA. It is to be noted that increase in iron intake after IFA supplementation was through dietary iron intake only. All the

subjects consumed >100% of RDA for fat. In case of beta-carotene 97.7% subjects could meet <50% of RDA only.

Figure 4.2.1(a) and 4.2.1(b) projects the mean nutrients intake of anemic elderly subjects as compared with RDA. From the figure it can be concluded that intake of all nutrients increased after the supplementation of IFA tablets.

Figure 4.2.1(a): Mean nutrients intake of elderly anemic women before and after IFA supplementation for 6 weeks

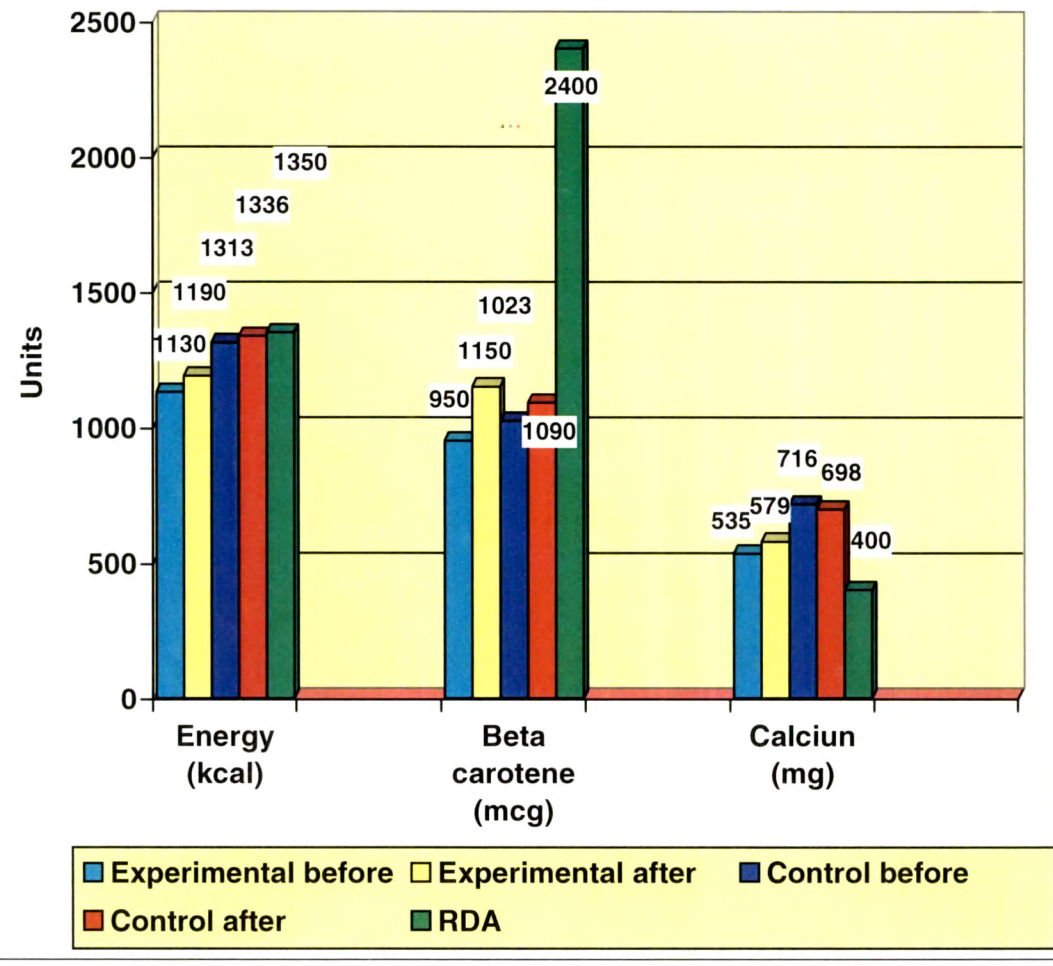
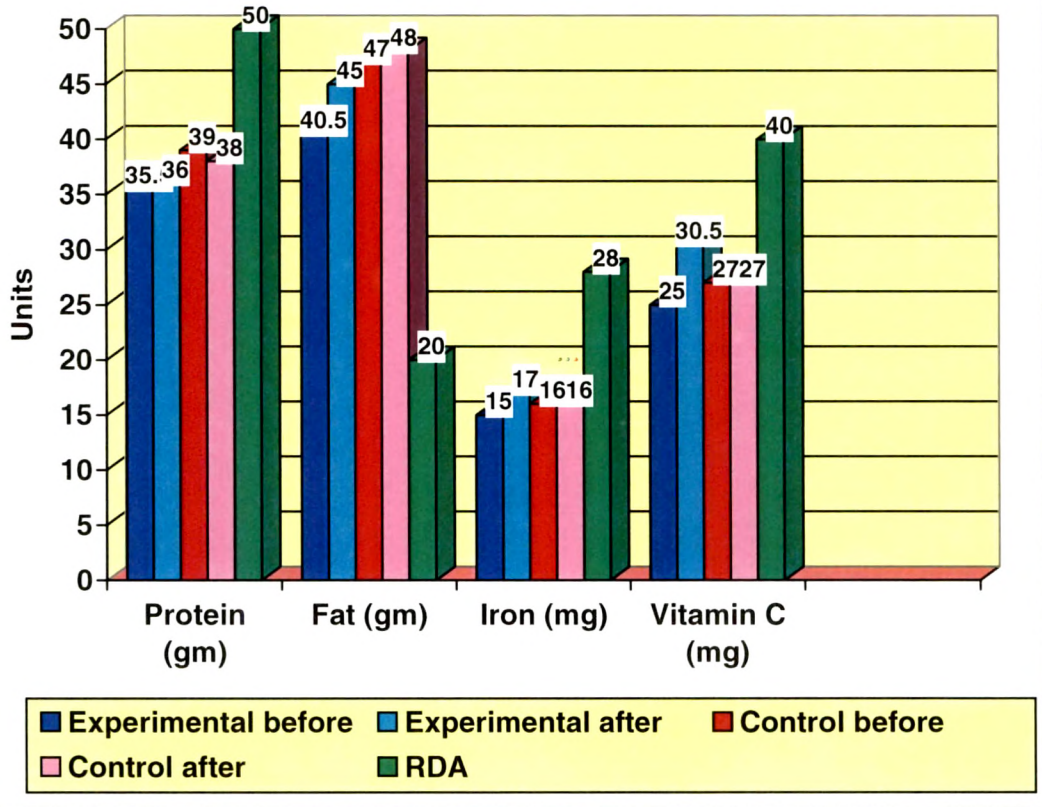


Figure 4.2.1(b): Mean nutrients intake of elderly anemic women before and after IFA supplementation for 6 weeks



2. HEMOGLOBIN LEVELS

All 75 subjects were anemic having hemoglobin levels below 12 gm / dl. The mean hemoglobin levels of the anemic women before intervention were falling under the category of moderate anemia. Table 4.2.4 shows the mean hemoglobin levels of anemic women before and after intervention with IFA supplementation along with control group. The subjects in experimental group and control had mean initial hemoglobin levels of 9.64gm/dl and 9.44gm/dl respectively.

Table 4.2.4: Mean hemoglobin levels of anemic women before and after intervention with IFA supplementation for 6 weeks (mean ± SE)

Groups	Hemoglobin levels gm/dl		
	0 week	6 weeks	Paired 't' test
Group with IFA supplementation (n=45)	9.64 ± 1.24	10.56 ± 1.09*	11.69*
Group without IFA supplementation (n=30)	9.44 ± 1.30	9.65 ± 1.23	2.32

*p<0.05

The above table 4.2.4 shows a rise of 0.9 gm/dl in the hemoglobin levels of subjects belonging to experimental group after the intervention with IFA tablets. The mean hemoglobin level, which was 9.64 gm % initially, showed an increase up to 10.56 gm%. This increase in levels was found statistically significant ($p<0.05$). Improvement in hemoglobin levels also showed a shift in the degree of anemia i.e. from moderate category to mild category of anemia. It was also supported by the reduced complaints of the minor illnesses and improvement in the general condition of the subjects on supplementation. It was interesting to note that there was decrease in the minor illnesses such as in the episodes of general weakness, fatigue, depression, irritability and lack of concentration.

It could be noted that the mean hemoglobin levels (9.44gm%-initial and 9.65gm% after) of subjects belonging to control group was also found in the moderate category of anemia before and after intervention period.

(i) Prevalence of Anemia and Effect of Iron Folic Acid Supplementation on the hemoglobin levels of subjects:

The percent prevalence of mild and moderate anemia in subjects as assessed by their hemoglobin levels before and after IFA supplementation is shown in table 4.2.5 and figure 4.2.2. The hemoglobin levels of majority of subjects before intervention in experimental group was found in moderate category of anemia shifted to mild degree of anemia (59.5%).

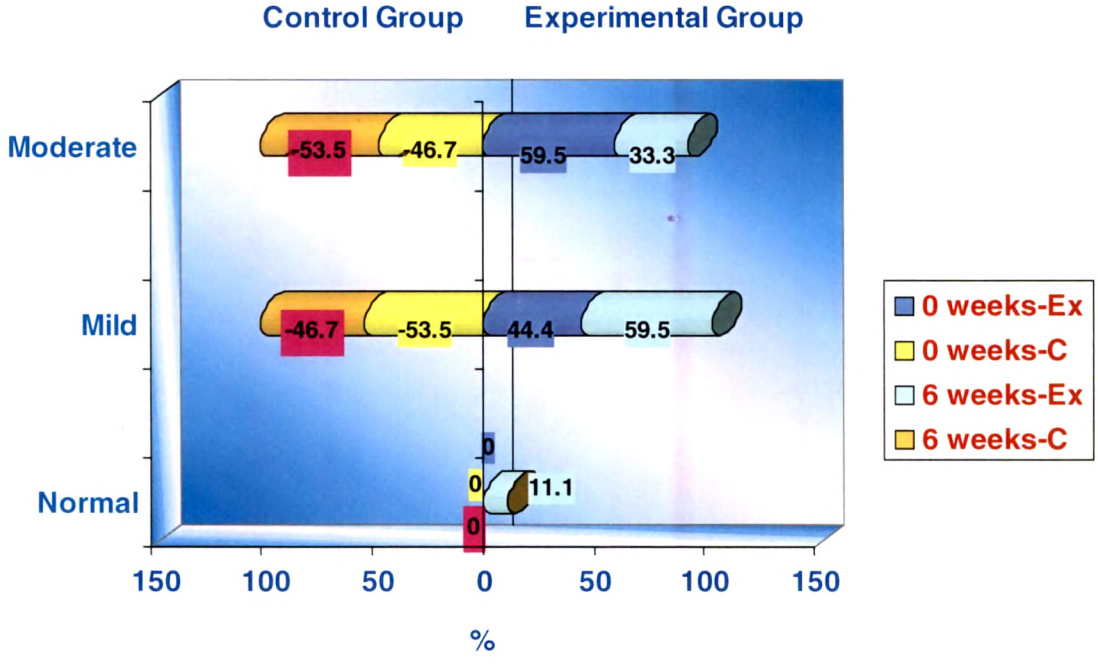
Table 4.2.5:Percentage of elderly anemic subjects showing impact of IFA supplementation on the prevalence of degrees of anemia

Hemoglobin levels (gm/dl)	Group with IFA supplementation N=45	Group without IFA supplementation N=30	Total N=75
7 – 9.9 Moderate anemia			
0 weeks intervention	59.5 (25)	46.7 (14)	52 (39)
6 weeks intervention	33.3 (15)	53.5 (16)	41.3 (31)
10 – 11.9 Mild anemia			
0 weeks intervention	44.4 (20)	53.5 (16)	48(36)
6 weeks intervention	59.5 (25)	46.7 (14)	52 (39)
≥ 12 Normal			
0 weeks intervention	0 (0)	0 (0)	0 (0)
6 weeks intervention	11.1 (5)	0 (0)	11.1 (5)

Figures in the parenthesis denote number of subjects

After the completion of the supplementation period, the hemoglobin levels of 11% subjects from the experimental group shifted to normal levels. Hence these subjects

Figure 4.2.2: Percentage of elderly anemic subjects showing different degree of anemia before and after intervention



were no longer anemic, depicting the beneficial effect of IFA supplementation on the elderly anemic subjects. On the other hand, in the control group situation was found reverse. Six percent of subjects who were in the mild category anemia before shifted to moderate category afterwards and none of the subjects reached normal hemoglobin levels. Percent prevalence of anemia among elderly anemic women showed slight difference between the groups. This indicated the improvement in the hemoglobin levels of experimental group after IFA supplementation. Overall findings showed that subjects who received IFA supplementation expressed feeling of well-being and better stamina while performing various activities. It is a well-established fact that improvements in the hemoglobin levels are highest when the demand is more. Thus it can be noted that IFA supplementation for a period of six weeks brought about an increase in the hemoglobin levels of the subjects, especially in those who had lower initial concentration.

3. PHYSICAL PERFORMANCE TESTS

To study the impact of IFA supplementation on experimental group of 30 anemic elderly women, other 30 age and hemoglobin matched subjects were selected as the control group. Control group subjects were not given any supplementation. These subjects were given physical performance and cognitive function tests. Data on physical performance test score and cognitive function test score was collected before and after intervention with IFA supplementation.

The physical performance test scores of the elderly anemic women with and without IFA supplementation at zero week and 6 weeks is shown in table 4.2.6 and figure 4.2.3 (a,b&c).

Table 4.2.6: Physical performance test score of anemic subjects before and after intervention with IFA supplementation for 6 weeks

Group	N	Performance in Physical Function Tests Mean ± SD								
		Standing Balance			Walking speed			Rise from a chair		
		0 week	6 weeks	Paired "t"	0 week	6 weeks	Paired "t"	0 week	6 weeks	Paired "t"
With IFA	30	2.13 ±1.19	2.73 ±0.94	4.54*	2.70 ±1.1	2.86 ±1.07	1.72 NS	2.36 ±1.15	2.83 ±1.05	3.29*
Without IFA	30	2.33 ±1.26	2.30 ±1.23	0.37 NS	2.63 ±1.06	2.66 ±1.02	0.57 NS	2.56 ±1.07	2.60 ±0.96	0.74 NS

*Significant at $p \leq 0.05$, $p \leq 0.01$, $p \leq 0.001$, NS: Not significant, IFA: Iron folic acid tablets

Figure 4.2.3 (a) Change in Physical Function Test Score of Elderly Women After IFA Supplementation For 6 Weeks

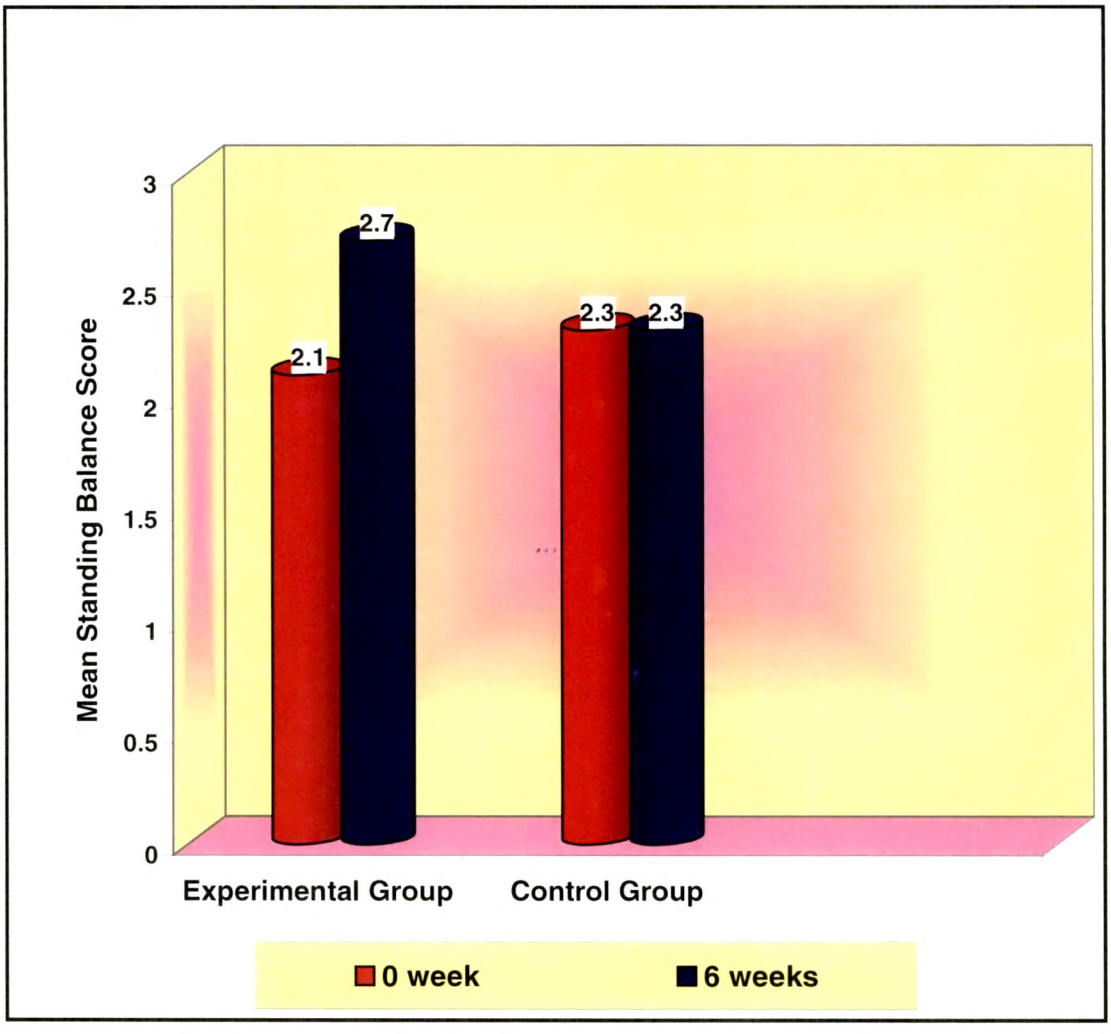


Figure 4.2.3 (b) Change in Physical Function Test Score of Elderly Women After IFA Supplementation For 6 Weeks

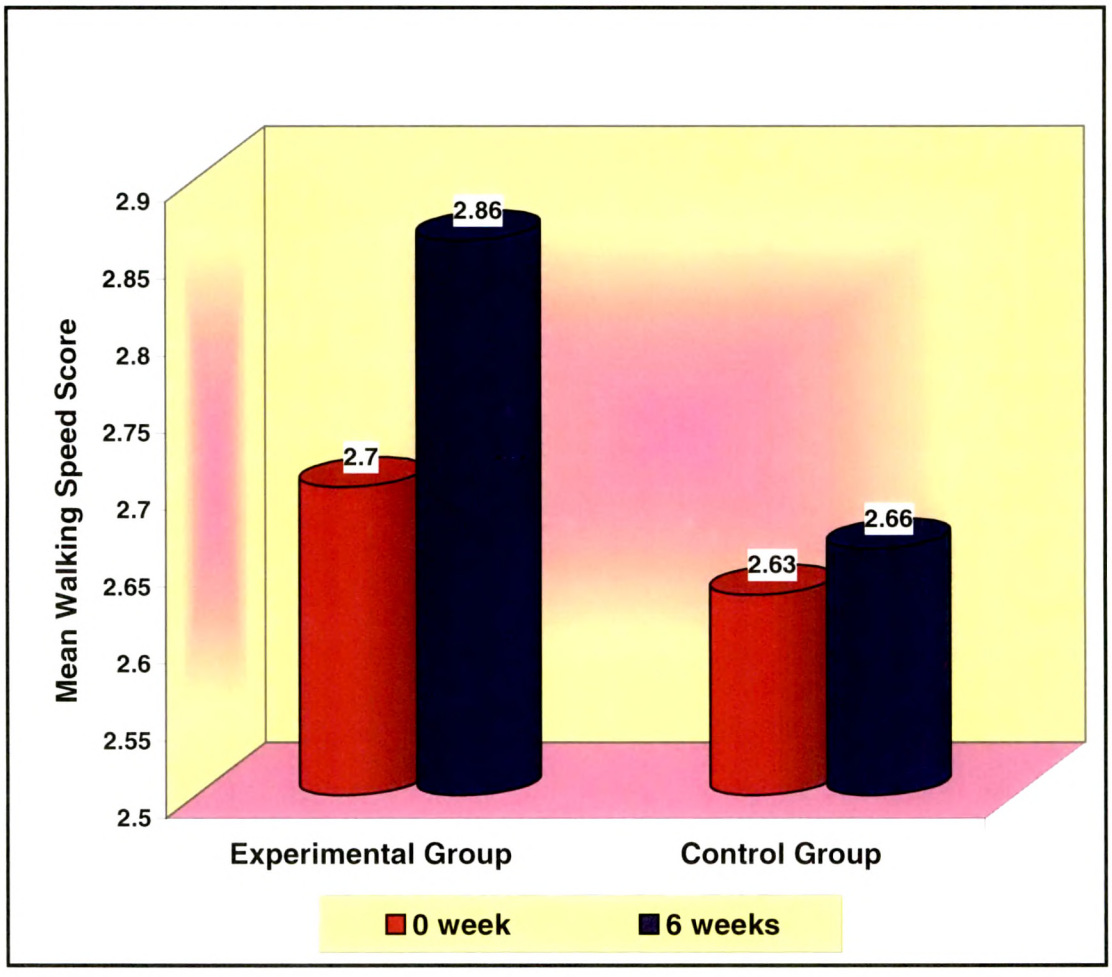
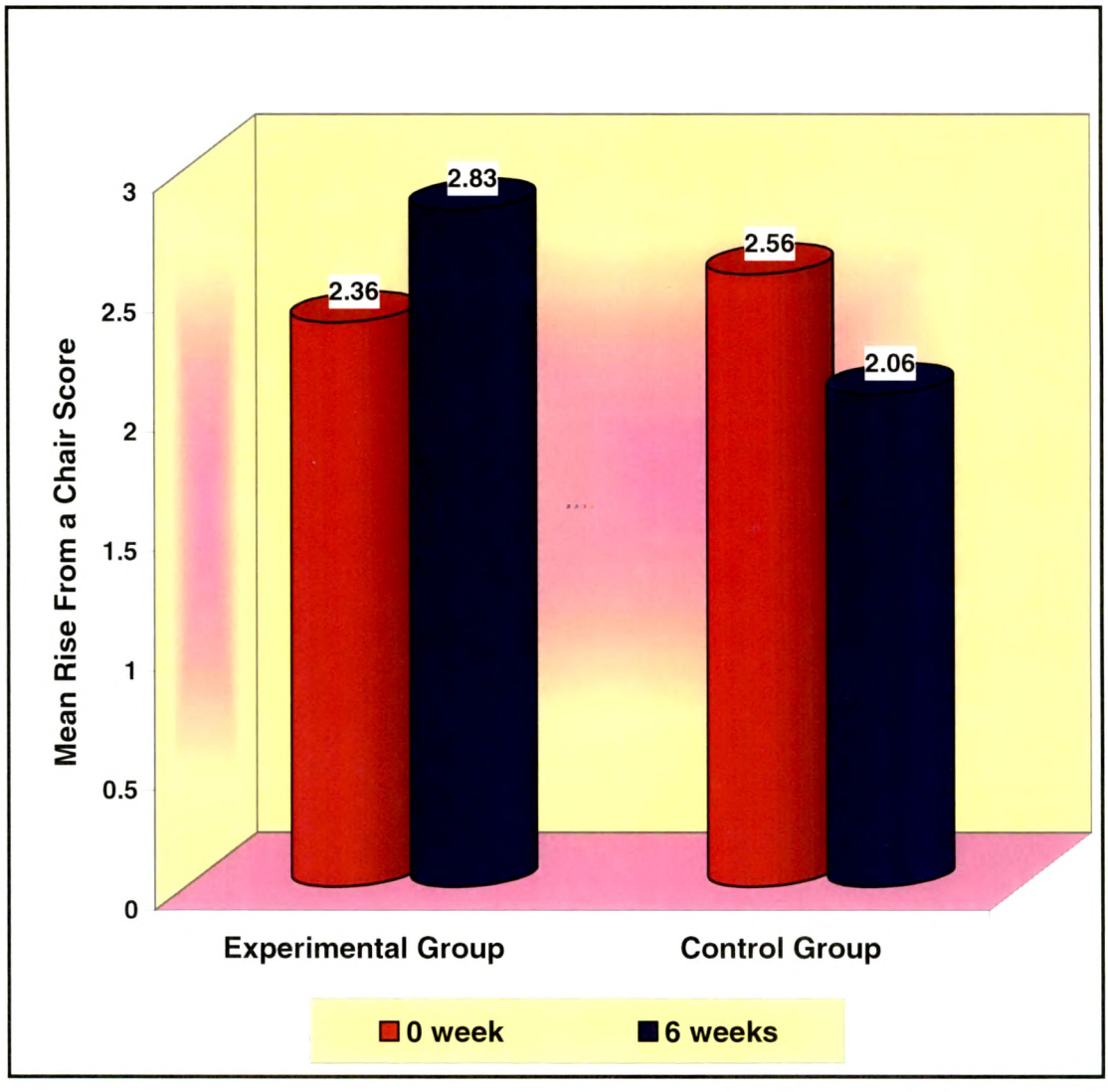


Figure 4.2.3 (c) Change in Physical Function Test Score of Elderly Women After IFA Supplementation For 6 Weeks



In the physical performance test scores, the experimental subjects showed highly significant differences as shown in table 4.2.6 and figure 4.2.4 (a, b & c).

The data on physical performance tests revealed that experimental group performed better than the control group in case of standing balance (score 2.13 to 2.73) and rise from a chair (2.36 to 2.83). The increase in the score was highly significant ($p<0.001$), which is considered as good response in physical performance after supplementation of IFA tablets. According to Pennix et. al.,(2003), in a study conducted at Lowa and Washington on elderly population under the epidemiological studies of elderly aged 65 years and older showed that anemia was an independent risk factor for subsequent decline in physical performance in older persons.

Seshadri (1996) conducted a study on anemic children. Intervention with IFA supplementation on daily basis was carried out. Findings showed that anemic children could perform better in their physical performance test after supplementation with IFA.

4. COGNITIVE FUNCTION TESTS

Cognitive function tests the ability of a person to recall, attentiveness and concentration power for any type of activity. It is a type of mental function test that was performed to study the impact of IFA supplementation on elderly anemic women.

The following table 4.2.7 and figure 4.2.4 (a) and (b) shows the mental function test scores before and after intervention with IFA supplementation.

Table 4.2.7: Mental function test score of anemic subjects before and after intervention with IFA supplementation for 6 weeks

Group	N	Performance in Mental Function Tests Mean ± SE					
		Attention and Concentration Test			Memory Test		
With IFA Intervention	30	0 week	6 weeks	Paired 't'	0 week	6 weeks	Paired 't'
		5.80±3.03	6.70±2.83	3.80*	4.53±1.99	5.23±2.54	2.00*
Without IFA Intervention	30	5.10±1.62	5.46±2.03	2.26NS	4.60±1.33	4.60±1.58	NS

***Significant at $p \leq 0.05$** **NS: Not Significant**
$p \leq 0.01$ **IFA: Iron Folic Acid Supplementation**
$p \leq 0.001$

The trend in the cognitive function was similar to those seen in the physical performance test. Table 4.2.7 and figure 4.2.5 (a and b) depicts the mean scores of mental function tests among anemic elderly women before and after intervention. Experimental group performed better and scored more compared to control group after intervention. There was a highly significant difference seen between the test score of memory test (score 4.53 to 5.23) and attention and concentration test (score 5.8 to 6.7) ($p<0.001$).

In a cross-sectional study conducted in Greece by Argyriadou et. al. (1999) showed the prevalence of cognitive impairment among anemic and non anemic women were 47.5% and 40.1% respectively.

Figure 4.2.4(a) Change in Cognitive Function Test Score of Elderly Women After IFA Supplementation For 6 Weeks

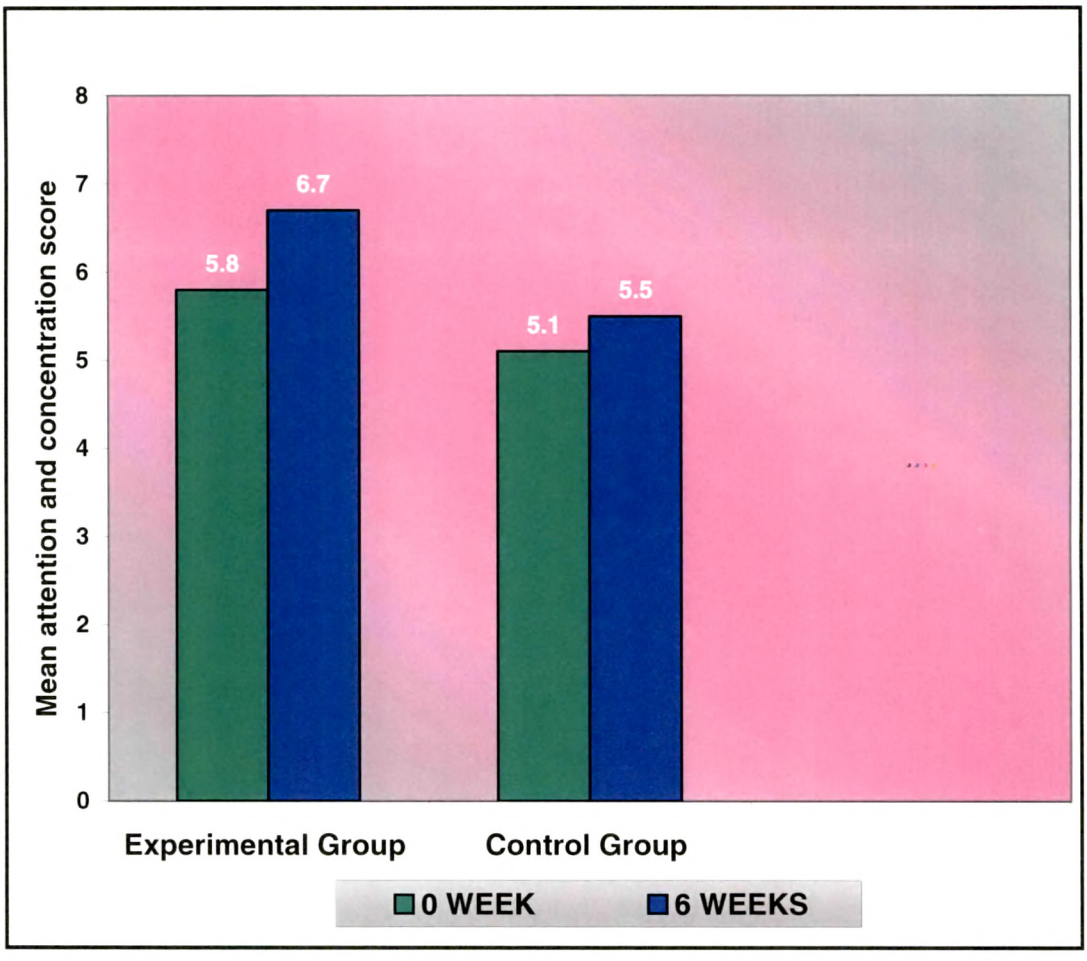
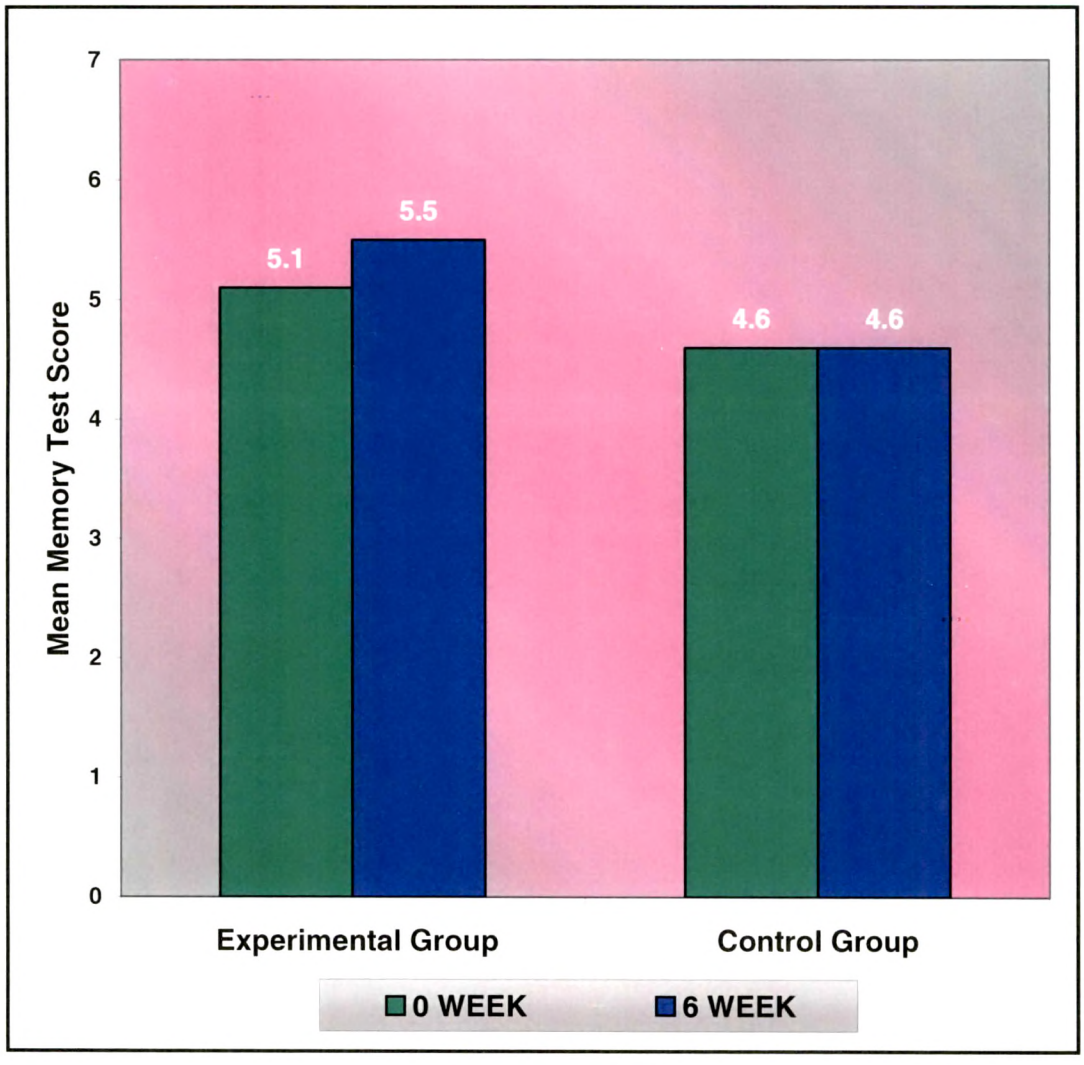


Figure 4.2.4(b) Change in Cognitive Function Test Score of Elderly Women After IFA Supplementation For 6 Weeks



Thus, it is clear that supplementation of Iron Folic Acid brings about definite improvement in cognitive functions and health of the elderly. Therefore, periodic clinical examination and subsequent appropriate intervention seems to play key role in promoting elderly's health.

PHASE III

DEVELOPMENT AND EVALUATION OF SOME SELECTED NUTRITIOUS FOOD ITEMS FOR GERIATRIC POPULATION.

Results of assessment of health and nutritional status of elderly women with different living arrangements and age groups carried out in first phase of the study, showed nutritional inadequacy except fat and calcium. It is important to note that lower nutrient intake was found in elderly women living alone and in old-old group subjects. Also, subjects belonging to these two groups depicted more problems. With regard to major and minor illnesses observations were made wherein elderly also made compromises in their diet, which worsened with poor health status. Therefore it was thought worthwhile to formulate food items, which would be suitable for geriatric population.

Two sets of food items were planned keeping in mind the type of requirement of the elderly population. These items were categorized as (a) Fresh soy based food items and (b) Quick cooking food items.

1) Fresh Soy based food items: Keeping in mind the prevalence of under weight among elderly population as reported in our study and several benefits of soy and its high protein content, four soybean food items were planned.

2) Quick cooking food items: These food items were developed essentially as ready to eat/convenient foods. Results of phase I have shown food related problems, nutritional inadequacies and digestive, chewing and swallowing problems apart from inconvenience in cooking as major contributory factor for avoidance of proper meals in elderly. Depression and loneliness in later decades of old age result in lack of activities and further lowering down of the food intake and many more compromises. Therefore it was thought necessary to develop quick cooking nutritious foods appropriate for geriatric population.

Development and acceptability of fresh soy and quick cooking food items were the main focus of this study. Items were planned using different variations (appendix III-C).

In view of the above objective the findings of the study are presented and discussed under the following headings:

1) DEVELOPMENT OF NUTRITIOUS FOOD ITEMS.
2) SENSORY EVALUATION OF FOOD ITEMS.
3) NUTRITIVE VALUE OF COOKED FOOD ITEMS AS PER THE SERVING SIZE.

1. DEVELOPMENT OF NUTRITIOUS FOOD ITEMS

1) Fresh soy food items: Four food items using soy as a major ingredient were developed. These food items were (a) Soy usal (b) Soy sambhar (c) Soy dhokli and (d) Soy stuffed paratha.

Soy Usal: Usal being very popular in Gujarat as heavy snack item, dry peas were replaced by soy and soy usal was developed. Usal preparation along with lots of masalas and sev garnished on the top made it highly acceptable among the elderly group (like sev usal).

Soy Sambhar: Sambhar is becoming popular item in Gujarat. Sambhar was prepared like tuver dal that was readily liked by the panel of judges. For accompaniment it was served with button idlis. This item was found to be highly acceptable among elderly.

Soy Dhokli: Dal-dhokli is a very common food item eaten widely in Gujarat. In this preparation tuver dal was replaced by soy dal and dhokli was also prepared using soy atta. All elderly relished this food when served hot.

Soy Stuffed Paratha: Stuffed aalu paratha is a traditional item that is prepared over in the breakfast. Potato filling was replaced at 2/3rd level and paratha were prepared.

Soy Roti: Roti is a very common item taken in the meal. To study the level of incorporation of soy atta in wheat flour, soy roti was prepared.

All the above food items were formulated in such a way that one serving would fulfill $1/4^{th}$ to $1/5^{th}$ requirement of protein except soy roti. Soy roti was served in place of normal rotis for lunch and dinner.

2) Quick cooking food items: Two quick cooking food items were developed keeping in mind very old elderly with multiple problems, may it be a social, economical, physical or mental problem. These items were developed with consideration based on the ready to eat/ convenient food items. The food items developed were (a) Carrot kheer and (b) Spinach with white sauce.

Carrot Kheer : Kheer is a common festive sweet food item liked by all elderly. All communities eat it in their own traditional ways. To make it micronutrient rich carrots were selected (protein, calcium, iron and β carotene) and to make quick cooking item rice flakes and milk powder was selected. Rice flakes being processed food ingredient acted as a thickening agent. Dehydrated grated carrots were added to the mix. To make one serving 200ml of hot water was added to the mix.

Spinach in white sauce: Carrot was replaced by spinach and item was developed. Dried spinach leaves, milk powder, rice flakes powder, salt and pepper powder were used to formulate the mix. Many elderly prefer soft food items. This item can be used as spread on chapatti, bhakri or as vegetable in a meal.

Method of preparation of all the food items is shown in appendix III-C.

2. SENSORY EVALUATION OF FOOD ITEMS

The sensory evaluation of seven food items were carried out using hedonic rating scale. Results are presented below.

Hedonic rating test consisted of 1 –9 point scale ranging from dislike extremely to like extremely. It was thought to study the impact of soy foods on the undernourished elderly. Therefore institutionalized elderly were selected for the intervention program. The evaluation of soy based food items were therefore carried out in the field itself by the institutionalized elderly. The results of these are presented in table 4.3.1. Other

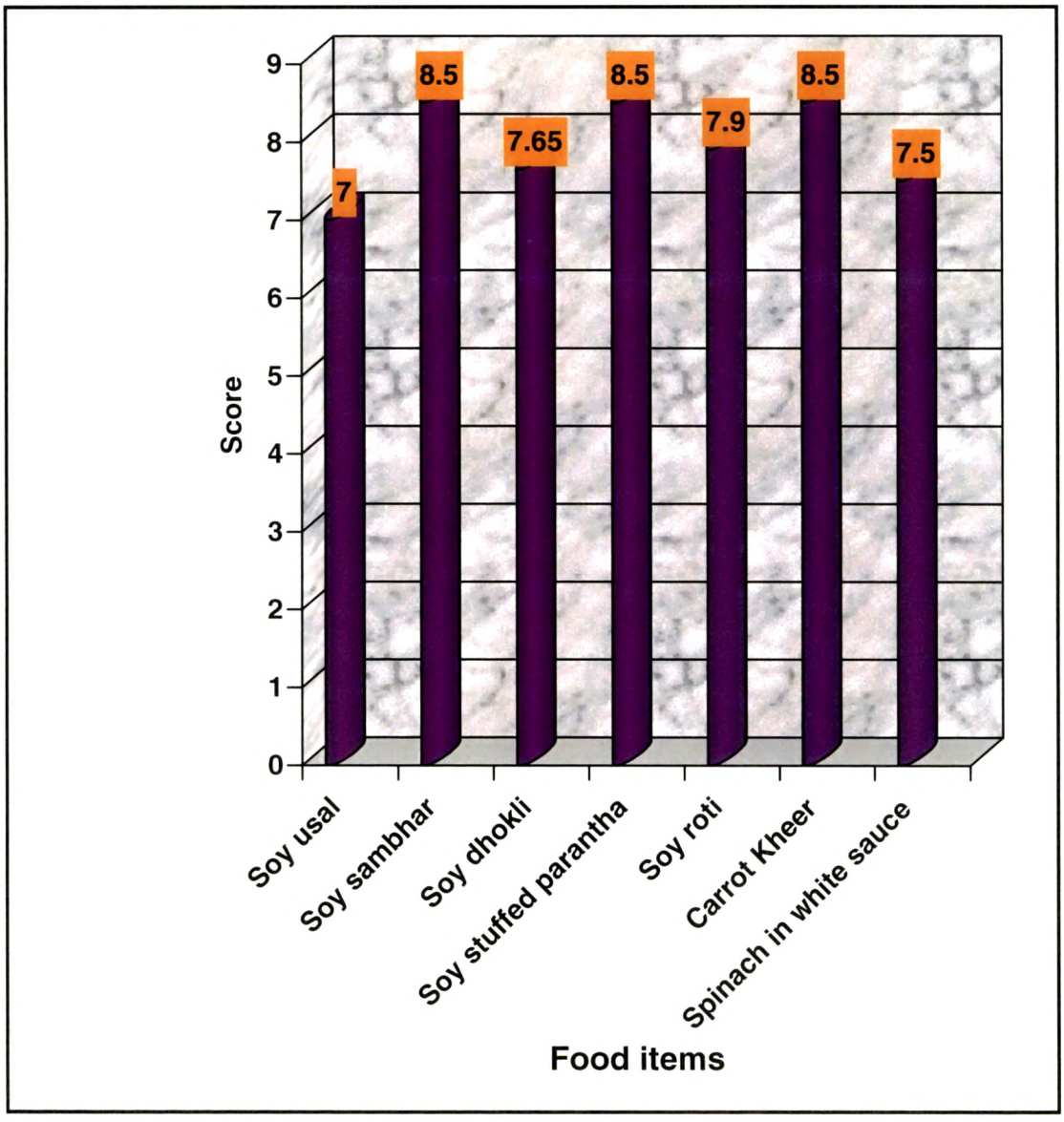
quick cooking two food items were prepared considering the nutritive requirements of the elderly subjects. Trained judges were selected from the Department of Foods and Nutrition. The results are presented in table 4.3.1.

Table 4.3.1: Mean scores of various soy and quick cooking food items on a 9 – point Hedonic scale

SR. NO.	FOOD ITEMS	SCORE MEAN ± SD
1.	Soy Usal	7.00 ± 1.17
2.	Soy Sambhar	8.50 ± 0.94
3.	Soy Dhokli	7.65 ± 1.14
4.	Soy Stuffed Paratha	8.50 ± 0.94
5.	Soy Roti	7.90 ± 0.91
6.	Carrot Kheer	8.50 ± 0.90
7.	Spinach in white sauce	7.45 ± 0.50

As seen from the table no. 4.3.1 and the figure (4.3.1) all the food items obtained score ≥7, suggesting that all the soy items were well accepted and liked by the institutionalized elderly subjects and quick cooking food items by trained judges respectively. Out of all the items Soy sambhar, Soy stuffed paratha and Carrot kheer obtained highest score of 8.5, followed by Soy roti (7.9), Soy dhokli (7.65), Spinach in white sauce (7.45) and Soy usal (7.0).

Figure 4.3.1: Mean scores of various food items on a 9 – point Hedonic scale obtained by institutionalized elderly and trained panel members



3. NUTRITIVE VALUE OF COOKED FOOD ITEMS AS PER THE SERVING SIZE

All the food items were cooked, dried and powdered for further analysis. Quick cooking food mixes were also subjected to analysis. Important nutrients i.e. protein, fat, iron and calcium were estimated as per the methods described in the third chapter (page no. 80-85). Additionally beta-carotene was estimated for quick cooking food items. To study proximate principles crude fibre and total ash were also estimated.

Table 4.3.2 – 4.3.5 depicts the nutrient composition of various food items which were developed for geriatric feeding. The analyzed values for specific nutrients were compared with the standard food composition tables as given in the Nutritive Value of Indian Foods, (Gopalan, 1994).

a. Protein

As can be seen from table 4.3.2, the protein content of various soy based and quick cooking food items ranged from 81.9 – 97% of the reported values. The protein values in case of whole soy food items ranged from 81.9 – 85.4% of reported values. The protein content of carrot kheer was found to be 92.7%, indicating that proteins were predominantly retained in dry items compared to wet semi solid food items (although all the semi solid food items were dried before analyzing). One serving of all the soy based cooked food items could fulfill 21 – 25% of RDA, whereas only one serving (one roti) of soy roti provided 12% of RDA. These findings suggested that all soy-based food were rich source of protein if taken as a meal in more amount or frequently in the diet.

b. Fat

The fat content of various food items is given in table 4.3.2. Analyzed values of fat found in various food items were 99.9% in soy usal, 96.5% in soy roti and 95.1% in soy dhokli. Slightly low percentage of values was reported in remaining food items, which ranged from 68.5 – 78% of reported values. This may be because of some amount of oil lost in to the container because of adherance. In case of soy roti puffing of roti in an open flame would have released the fat, bound to starch resulting in

higher estimated fat value during analysis. Puffing on an open flame was not involved in the preparation of soy stuffed paratha. All the four soy based food items could satisfy 23 to 57% of RDA for fat. Quick cooking food items supplied 3 to 7% of RDA.

Gopalan (2000) also has reported such differences in the content of fat of roti and paratha prepared out of wheat flour.

Table 4.3.2: Protein, Fat and percent of RDA supplied by various food items (per serving)

Sr. No	Food Items	Protein (gms) Mean ± SD		% RDA	Fat (gms) Mean ± SD		% RDA
1.	**Soy Based**	**Calculated Values**	**Analyzed Values**		**Calculated Values**	**Analyzed Values**	
a.	Soy usal	15.17	12.70 ± 0.14	25	17.02	17.00 ± 0.94	56.6
b.	Soy sambhar	12.57	10.73 ± 0.89	21.5	10.50	8.35 ± 0.38	27.8
c.	Soy dhokli	12.72	10.43 ± 0.86	21	15.15	14.41 ± 3.86	48
d.	Soy stuffed paratha	14.15	11.78 ± 0.3	24	10.33	7.08 ± 0.5	23.6
e.	Soy roti	6.08	5.90 ± 0.07	12	5.45	5.26 ± 0.28	17.5
2.	**Quick cooking**						
a.	Carrot kheer	4.30	3.99 ± 0.87	8	1.32	1.03 ± 0.1	3.4
b.	Spinach in white sauce	6.03	5.85 ± 0.12	12	2.96	2.06 ± 1.42	6.8

% RDA calculated for cooked foods

Table 4.3.2 revealed that with regard to fat content one serving of soy food items could satisfy 24 to 57% of RDA for elderly, whereas one serving of carrot kheer and spinach in white sauce could supply 3.4 and 6.8% of RDA of fat respectively.

c. Total Ash

The calculated and analyzed value of total ash and crude fibre in various food items are presented in table 4.3.3.

Table 4.3.3: Total Ash and Crude Fibre content of various food items

Sr. No.	Food Items	Total Ash (gms) Mean ± SD		Crude Fibre (gms) Mean ± SD	
1.	**Soy Based**	**Calculated Values**	**Analyzed Values**	**Calculated Values**	**Analyzed Values**
a.	Soy usal	1.26	1.03 ± 0.10	1.30	0.73 ± 0.14
b.	Soy sambhar	1.29	1.23 ± 0.17	1.13	1.08 ± 0.20
c.	Soy dhokli	1.29	1.14 ± 0.08	1.85	0.91 ± 0.17
d.	Soy stuffed paratha	1.95	1.39 ± 0.10	1.49	2.46 ± 0.60
e.	Soy roti	1.05	0.93 ± 0.11	2.13	1.96 ± 0.17
2.	**Quick cooking**				
a.	Carrot kheer	0.96	0.83 ± 0.11	0.51	0.38 ± 0.05
b.	Spinach in white sauce	1.05	0.90 ± 0.00	0.81	1.13 ± 0.64

As can be seen from the table 4.3.3, the percent analyzed values of total ash in various food items ranged from 71.2 – 95.3% of reported values. The decrease in value may be due to method of preparation, soaking and grinding, which would have resulted in the leaching of some of the minerals. It has been reported by Pawar and Parlikar (1990), that there was decrease in ash content of the food items due to dehulling and soaking process followed prior to cooking.

d. Crude Fibre

Table 4.3.3 shows the reported values of crude fibre content in various food items. Analyzed crude fibre content ranged from 35.4 – 165.1% of calculated value. The crude fibre content of certain food items like Spinach in white sauce and Soy stuffed paratha was found to be higher by 39.5% and 65.1% respectively. This increase and decrease in the values may be attributed to method of preparation, grinding and drying of the items.

e. Calcium

As seen from table 4.3.4, the calcium content of various cooked food items ranged from 94.2 – 107.6% of the reported value. About 19 – 20% of RDA of calcium was fulfilled by soy based food items where as quick cooking food items supplied more than 25% of RDA i.e. 26% in carrot kheer and 39% in spinach in white sauce.

Table 4.3.4: Calcium, Iron and percent RDA as supplied by various food items (per serving)

Sr. No.	Food Items	Calcium (mg) Mean ± SD		% RDA	Iron (mg) Mean ± SD		% RDA
1.	**Soy Based**	**Calculated Values**	**Analyzed Values**		**Calculated Values**	**Analyzed Values**	
a.	Soy usal	80.69	76.03 ± 3.7	19	3.78	4.46 ± 0.36	16 (13.5)
b.	Soy sambhar	78.60	75.03 ± 7.51	19	3.64	3.83 ± 0.30	14(13)
c.	Soy dhokli	76.00	81.76 ± 1.52	20	3.50	3.65 ± 0.43	13(12.5)
d.	Soy stuffed paratha	74.00	117.2 ± 24.31	29 (18.5)	3.93	6.73 ± 0.97	24(14)
e.	Soy roti	27.40	29.50 ± 0.4	7	1.77	2.23 ± 0.14	8(6)
2.	**Quick cooking**						
a.	Carrot kheer	104.3	105.5 ± 2.93	26	6.30	6.83 ± 0.30	24(22.5)
b.	Spinach in white sauce	153.3	156.4 ± 4.31	39 (38.3)	7.14	8.00 ± 0.40	28.5(25.5)

Figures in the parenthesis denote % of RDA in calculated food item.

f. Iron

The iron content of various cooked food items is given in table 4.3.4. Iron was the only nutrient, which on analyzing exhibited the values higher than the reported values for all the cooked food items. The iron content of various food items was found to be 4.2 – 171.2% higher than the reported values.

It has been reported by Rao and Prabhavati (1982), that cereals and legumes as purchased from local market, contain a significant amount of iron (13 – 47% of total)

as surface contamination. They concluded that a fair proportion of total iron present in the food grains as sold in the market is contributed by the contamination iron, which is nutritionally unavailable.

Seshadri and Anand (1991) reported similar results in a study where the nutrient composition of 12 regional meals was studied. The estimated iron content of the meals was found to be 25 – 151% higher than the reported values.

The soy based raw (calculated) food items provided around 13 – 14% of RDA of iron and quick cooking raw food item provided 22.5% and 25.5% for carrot kheer and spinach in white sauce respectively.

g. Beta carotene:

Beta-carotene was analyzed from quick cooking food items only. The calculated and analyzed β carotene content is given in table 4.3.5.

Table 4.3.5: Beta-carotene content and percent of RDA of quick cooking food items

Sr. no.	Quick cooking food items	Beta carotene (μg) Mean ± SD		% RDA
		Calculated Value	Analyzed Value	
1.	Carrot kheer	2151	2992 ± 967	99.7
2.	Spinach in white sauce	2740	2310 ± 560	77.0

From the table 4.3.5, it can be noted that calculated and estimated beta-carotene content of the quick cooking food items were different. Carrot kheer showed high values which could be due to the method of preparation of sample before and during estimation and type of analytical procedure. Spinach in white sauce obtained low estimated values. Both the food items could supply 77 to 99% of RDA for beta-carotene.

Thus, all the food items were found suitable for geriatric feeding.

Attempt was made to analyze the products though considerable differences were noted between analyzed and calculated value owing to reasons like method of preparation, method of analysis and contaminated ingredients or different variety of ingredients but all items were nutritionally satisfying.

It is difficult to give ranking to food items. Attempt was made to compare all the developed food items based on their sensory evaluation and nutritive composition.

Table 4.3.6 shows the comparison of all food items.

Table 4.3.6: Comparison of selected food items based on their sensory evaluation and nutritive composition

Sr. No.	Food Items	Protein (gms) Mean ± SD		Fat (gms) Mean ± SD		Calcium (mg) Mean ± SD		Iron (mg) Mean ± SD		Hedonic score Mean ± SD
1.	Soy Based	Calculated Values	Analyzed Values	Calculated Values	Analyzed Values	Calculated Values	Analyzed Values	Calculated Values	Analyzed Values	
a.	Soy usal	15.17	12.70 ± 0.14	17.02	17.00 ± 0.94	80.69	76.03 ± 3.7	3.78	4.46 ± 0.36	7 ± 1.17
b.	Soy sambhar	12.57	10.73 ± 0.89	10.50	8.35 ± 0.38	78.60	75.03 ± 7.51	3.64	3.83 ± 0.30	8.5 ± 0.94
c.	Soy dhokli	12.72	10.43 ± 0.86	15.15	14.41 ± 3.86	76.00	81.76 ± 1.52	3.50	3.65 ± 0.43	7.65 ± 1.14
d.	Soy paratha	14.15	11.78 ± 0.3	10.33	7.08 ± 0.5	74.00	117.2 ± 24.31	3.93	6.73 ± 0.97	8.5 ± 0.94
e.	Soy roti	6.08	5.90 ± 0.07	5.45	5.26 ± 0.28	27.40	29.50 ± 0.4	1.77	2.23 ± 0.14	7.9 ± 0.91
2.	Quick									
a.	Carrot kheer	4.30	3.99 ± 0.87	1.32	1.03 ± 0.1	104.3	105.5 ± 2.93	6.30	6.83 ± 0.30	8.5 ± 0.9
b.	Spinach in white sauce	6.03	5.85 ± 0.12	2.96	2.06 ± 1.42	153.3	156.4 ± 4.31	7.14	8.00 ± 0.40	7.45 ± 0.5

Table 4.3.6 showed that when comparisons were made with regard to sensory evaluation and nutritive composition, among soy based food items, soy sambhar ranked first, followed by soy stuffed paratha, soy usal and soy dhokli. In case of quick cooking food items carrot kheer was found to be superior as compared to spinach in white sauce.

Thus, the study showed that soybean items could be popularized amongst needy groups. Similarly, quick cooking items also showed great potential for the use by the elderly population.

PHASE:IV

ASSESSESSMENT OF EFFECT OF SOY FOODS ON HEALTH AND NUTRITIONAL STATUS OF INSTITUTIONALIZED ELDERLY SUBJECTS.

Institutionalized elderly are the most vulnerable group of people in the society today. Their health and nutritional status have been reported to be low by many workers (Limaye, 1999). It was therefore thought worthwhile to explore the possibilities of popularizing soy foods and study their impact on health and nutritional status of the elderly. It was found appropriate to provide one serving of soy food item in the breakfast every day, which would supply 14-23 gms of protein along with soy roti as partial supplementation in the two major meals of the day.

The specific objective of the study were: 1) To collect data on socio demographic profile. 2) To assess dietary intake, nutritional status and health profile of the institutionalized elderly. 3) To supplement soy foods for a period of three months and study various parameters for diet, nutrition and health profile after six weeks and at the end of three months.

All the occupants (20) from the Jalaram Vridh Ashram, Warasia, Vadodara were studied. Data obtained from the subjects was analyzed by applying appropriate statistical tests. Results are described, discussed and interpreted under the following headings:

A. PRE INTERVENTION DATA OF INSTITUTIONALISED ELDERLY

i) Socio-demographic characteristics

ii) Lifestyle factors

iii) Nutritional status: Anthropometric measurements and dietary intake

iv) Clinical parameters

v) Morbidity profile

B. SOY FOOD INTERVENTION FOR THREE MONTHS

C. POST INTERVENTION DATA OF INSTITUTIONALISED ELDERLY SUBJECTS

i) Nutritional status: Anthropometric measurements and dietary intake

ii) Clinical parameters

iii) Morbidity profile

A. PRE INTERVENTION DATA OF THE INSTITUTIONALISED ELDERLY

1. Socio-demographic characteristics

Socio-demographic data was collected using a pre-tested questionnaire. Assessment of socio-demographic profile included information on age, marital status, education, type of family in past, spouse status, present source of income and past monthly income. A comprehensive picture of it is given in table 4.4.1.

Table 4.4.1: Percentage of institutionalized elderly showing socio-demographic status

SR. NO.	CHARACTERISTICS	MALES (n=14) %	FEMALES (n=6) %	TOTAL (n=20) %
1.	Age (years)			
	60 – 69	21(3)	17(1)	20(4)
	70 – 79	79(11)	66(4)	75(15)
	80 – 89	---	17(1)	5(1)
	≥ 90	---	---	---
2.	Sex			
	Males	100(14)	---	70(14)
	Females	---	100(6)	30(6)
3.	Marital Status			
	Unmarried	29(4)	---	20(4)
	Married	14(2)	17(1)	15(3)
	Widow	---	83(5)	25(5)
	Widower	57(8)	---	40(8)
4.	Educational level			
	Primary School	29(4)	50(3)	35(7)
	High School	64(9)	33(2)	55(11)

	University	7(1)	17(1)	10(2)
5.	Family Type (Past)			
	Joint	50(7)	33(2)	45(9)
	Nuclear	50(7)	67(4)	55(11)
6.	Mother Tongue			
	Marathi	---	17(1)	5(1)
	Gujarati	57(8)	66(4)	60(12)
	Punjabi	14(2)	17(1)	15(3)
	Sindhi	29(4)	---	20(4)
7.	Children			
	Have Children	57(8)	83(5)	65(13)
	Do not have Children	43(6)	17(1)	35(7)
8.	Source of Income			
	Savings	29(4)	33(2)	30(6)
	Dependent on Children	21(3)	50(3)	30(6)
	Dependent on Others	50(7)	17(1)	40(8)
9.	Monthly Income Rs. (Past)			
	<250	36(5)	33(2)	35(7)
	250 – 500	14(2)	33(2)	20(4)
	500 – 750	21(3)	17(1)	20(4)
	>750	29(4)	17(1)	25(5)

Figures in the parenthesis denote number of subjects.

From table 4.4.1, it can be observed that 75% of the elderly living in the institution were between the age group of 70 – 80 years. Moreover 5% were above 80 years of age amongst the institutionalized elderly subjects. It is during the seventh decade of life when ageing process affects the physiological and structural systems of the body that is associated with the functional decline. It emphasizes the need of managing the ever-increasing health and psychological problems of these groups.

The data on marital status revealed that 85% of the institutionalized elderly population were singles i.e., unmarried or widow / widower which suggested that because of increased demands in terms of care taking, health associated factors and absence of

care giver at home in case of singles, led to higher number of such subjects in the institution. When compared between men and women it was found that though the numbers of female subjects were less, the percentage of widow was more than the widower. As per census data reviewed by Bose and Shankerdass (2004), the data also showed more number of elderly widowed female in India (54%) as well as in Gujarat (52.7%) compared to elderly male (15%).

Data on source of income at the time of survey showed that 30% of the subjects were dependent on their savings, 30% were dependent on their children and the rest 40% were dependent on others i.e., combination support which included relatives, well wishers, and society.

Ramachandran and Radhika (2006) carried out a study on problems of elderly women in India and Japan. One hundred fifty elderly subjects from India and Japan were studied and the financial data revealed that majority of respondents from Japan (85%) were not dependent on their children as against 63% in India.

2. Lifestyle factors

i) Socialization:

All the inmates in the institution were allowed to meet their relatives and friends. Table 4.4.2 shows the frequency of visits by relatives and friends in the institution.

Table 4.4.2: Percentage of institutionalized elderly visited by relatives and friends (n=20).

Sr. No.	Frequency of Visits	Friends %	Relatives %
1.	Daily	5(1)	5(1)
2.	Weekly	5(1)	30(6)
3.	Monthly	20(4)	30(6)

Figures in the parenthesis denote number of subjects.

Table 4.4.2 showed that 30% of subjects were visited weekly or monthly by their relatives and very few subjects were visited by friends. Thus, there was hardly any interaction of the subjects with the outside world.

ii) Activity Pattern:

The data on the activity pattern was collected using 24-hour activity recall method and was divided into sedentary, moderate and heavy activities that are presented in table 4.4.3(a).

Table 4.4.3 (a): Percent distribution of activity pattern of institutionalized elderly

Sr. No.	Activity	Total n=20
1.	Sedentary	80%
2.	Moderate	20%
3.	Heavy	---

As per the above table 4.4.4(a), it can be noted that 80% of the subjects in the institution were living a sedentary life by performing activities like reading, chatting and praying. Other 20% of the subjects were involved in moderate activities like walking, purchasing of fruits for themselves and visiting temple. Elderly people living in the institution kept them engaged in some sort of institutional activity. The women were engaged in kitchen activity like cutting vegetables and men were involved in purchasing (accompanied by servant).

The information regarding activity pattern was also collected using a questionnaire in terms of selected relevant activities. Activity pattern of the institutionalized elderly in past and at present is depicted in table 4.4.3(b).

Table 4.4.3(b): Percentage of institutionalized elderly involved in different activities in past and at present (n=20)

Sr. No.	Activities	Past * (%)	Present (%)
1.	Sports	55(11)	5(1)
2.	Exercise	50(10)	20(4)
3.	Walking	45(9)	30(6)
4.	Reading	70(14)	45(9)
5.	Watching Television	65(13)	40(8)
6.	Listening to Music	60(12)	20(4)
7.	Meditation	5(1)	45(9)
8.	Prayers	35(7)	95(19)
9.	Listening to Bhajans and Lectures	25(5)	55(11)
10.	Yoga	5(1)	10(2)

*Before 10 years

Figures in the parenthesis denote number of subjects.

From table 4.4.3 (b) it can be seen that the percentage of elderly involved in sports has reduced presently mainly because of decline in health. More number of elderly were presently involved in activities like reading, meditation, prayers and bhajans, because the subjects were more inclined towards spiritual activities for reducing mental stress. Percentage of elderly subjects listening to music had decreased from 60% to 20% because of economic limitations and also because of dormitory system in the institution.

iii) Addiction Pattern:

Past and present addiction pattern was noted using a questionnaire, which is shown in the table 4.4.4.

Table 4.4.4: Percentage of institutionalized elderly showing past and present addiction pattern (n=20)

Sr. No.	Addiction	Past * (%)	Present (%)
1.	Alcohol	15(3)	---
2.	Smoking	20(4)	5(1)
3.	Chewing tobacco	15(3)	---
4.	Eating pan – supari	15(3)	5(1)
5.	Tea	100(20)	100(20)

* Before 10 years

Figures in the parenthesis denote number of subjects.

Table 4.4.4 makes it clear that high percentage of subjects were addicted to various habits in the past than at present. A marked change was observed in addiction pattern over a decade except tea consumption. All the subjects consumed tea daily as the institution provided it. These change could be due to various health problems, advancing age, lack of availability / opportunity and scarcity of funds for such addictions.

3. Nutritional status

Nutritional status of institutionalized elderly was assessed in terms of anthropometric measurements, clinical parameters and diet profile using appropriate tools as described in methodology.

(i) Anthropometric measurements:

Table 4.4.5 shows the results of the anthropometric measurements of the institutionalized elderly subjects before intervention.

Table 4.4.5: Mean anthropometric measurements of institutionalized elderly subjects before intervention

SR. NO.	INDICES	MALES (n=12) MEAN ± SD	FEMALES (n=6) MEAN ± SD
1.	Height (m)	1.60 ± 0.06	1.46 ± 0.04
2.	Weight (kg)	53.08 ± 13.79	44.83 ± 9.26
3.	MUAC (cm)	25.83 ± 4.78	24.50 ± 3.61
4.	BMI (kg / m^2)	20.62 ± 5.60	20.41 ± 3.63

As per table 4.4.5, there were much differences found between the weight of the men and women compared to their BMI and MUAC measurements. All the values were falling under the normal category except weight. A study by Dabas et. al., (1996), reported that institutionalized elderly women in Delhi had higher mean arm circumference compared to men. The mean height of the subjects did not show much variability but the height and total arm length have been significantly correlated. Limaye (1999) also found similar results in study carried out on 50 elderly each from two different institutions.

Table 4.4.6 shows the prevalence of weight distribution in the institutionalized elderly. It was noted that fifty percent of the subjects were under weight, 33.3% of the subjects were healthy and 16.6% were found to be overweight.

Table 4.4.6: Percentage of subjects showing prevalence of weight distribution

Categories	Total % (n=18)
Under weight	50(9)
Healthy	33.3(6)
Over weight	16.6(3)

Figures in the parenthesis denote number of subjects.

Sarojini et. al., (1990) conducted a study on 152 elderly subjects in urban areas of Karnataka. The findings of the study showed that only 28.3% subjects had normal weight, 29.4% were under weight and 31.6% were found severely under weight, 6.6% were over weight and 3.9% were found obese.

(ii) Dietary intake:

The nutrient intakes of all the subjects were calculated by using 24-hour dietary recall method. Mean nutrient intakes of elderly males and females are shown in table 4.4.7.

Table 4.4.7: Mean nutrient intakes of institutionalized elderly male and female before intervention

SR. NO.	NUTRIENTS	RDA (MALE)	MALE (n=12) MEAN ± SD	RDA (FEMALE)	FEMALE (n=6) MEAN ± SD
1.	Energy (Kcal)	1750	1711 ± 515	1350	1420 ± 302
2.	Protein (gm)	60	47.89 ± 11.20	50	44.96 ± 11.39
3.	Fat (gm)	30	70.86 ± 21.74	30	66.93 ± 20.29
4.	Fibre (gm)	20	4.44 ± 2.16	20	3.74 ± 0.8
5.	Calcium (mg)	400	472 ± 160	400	383 ± 45
6.	Iron (mg)	30	20.63 ± 4.47	28	17.54 ± 3.48
7.	β-carotene (μg)	3000	581 ± 102	3000	618 ± 107
8.	Vitamin-C (mg)	40	28.83 ± 18.26	40	26.11 ± 12.76

RDA source as given by Natarajan, 1991.

The mean nutrient intake of institutionalized males (table 4.4.7) revealed that diets were found to be deficient in protein, fibre, iron, β-carotene and vitamin-C when compared to the recommended dietary allowance (RDA). Fat was consumed in more than double amount then required. In case of energy, elderly male consumed almost in required amounts, whereas elderly female consumed more than RDA. With regard to other nutrients, similar results were found in the diet of the elderly female also.

Srivastave et. al., (1996) studied elderly patients attending the geriatric clinic at AIIMS, New Delhi. The results showed deficiency of 50% energy, 16% protein, 51.4% for

calcium, 68.5% in iron and 50% for thiamine in the diet of the elderly men. Similarly dietary intake of 120 elderly women from MIG and HIG subjects could not meet the RDA of energy, protein, iron and β carotene (Mehta et. al., 1997).

The percentage of the institutionalized elderly subjects consuming different nutrients at various levels of RDA are summarized in table 4.4.8.

Table 4.4.8: Percentage consumption of different nutrients at various levels of percent RDA by institutionalized elderly before intervention (n=18)

SR. NO.	NUTRIENTS	% RDA			
		≤50	51-75	76-100	>100
1.	Energy (Kcal)	5.6(1)	5.6(1)	38.9(7)	50(9)
2.	Protein (gm)	5.6(1)	22.2(4)	61.1(11)	11.1(2)
3.	Fat (gm)	---	---	---	100(18)
4.	Fibre (gm)	89(16)	11.1(2)	---	---
5.	Calcium (mg)	---	---	50(9)	50(9)
6.	Iron (mg)	16.7(3)	61.1(11)	22.2(4)	---
7.	β-carotene (μg)	100(18)	---	---	---
8.	Vitamin-C (mg)	44.4(8)	16.7(3)	11.1(2)	27.8(5)

Figures in the parenthesis denote number of subjects.

It could be noted from table (4.4.8) that 5.6% of the subjects had energy and protein intake less than 50% of the RDA, whereas 50% and 11.1% of the subjects could meet more than 100 % RDA for energy and protein respectively. All the subjects had fat intake as >100% of the RDA. In case of β-carotene, intake was less than 50% of RDA for all the subjects. Only 11.1% subjects could meet 76-100% RDA for vitamin-C and about half of the subjects could meet less then 50% of RDA for vitamin-C. The deficient intake of β-carotene, vitamin-C and fibre could be due to poor supply and intake of green leafy vegetables and fruits in the diet of the elderly in the institution.

A series of studies conducted on elderly subjects by the Department of Foods and Nutrition, Vadodara have reported consistently the deficiency in intake of major

nutrients in the diet of the free living as well as institutionalized elderly population (Mehta and Shringarpure, 2000).

4. Clinical Parameters:

Nutritional status of the institutionalized subjects was also studied by assessing various clinical parameters like hemoglobin levels, serum protein levels, lipid profile, random blood glucose and blood pressure.

a. Hemoglobin levels:

The initial mean hemoglobin and serum total protein values of the institutionalized elderly are presented in table 4.4.9.

Table 4.4.9: Mean hemoglobin and serum total protein values of institutionalized elderly before intervention

SR. NO.	PARAMETERS	MALES (N=12) MEAN ± SD	FEMALES (N=6) MEAN ± SD
1.	Hemoglobin (gm/dl)	11.20 ± 1.34	11.70 ± 0.60
	Normal values	14 gm/dl	12 gm/dl
2.	Serum total protein (gm/dl)	6.70 ± 0.65	6.40 ± 0.54
	Normal values	6 – 8 gm/dl	6 – 8 gm/dl

From the above table 4.4.9, it can be revealed that the hemoglobin levels of elderly men were found low compared to elderly women, and was also below the normal cut off value. The mean serum total protein values were found in the normal range for both elderly men and elderly women.

Severity of the deficiency in hemoglobin levels was indicative in the data drawn on the percent prevalence of degree of anemia among institutionalized elderly subjects. The obtained data on prevalence of degree of anemia in institutionalized elderly subjects is presented in table 4.4.10.

Table 4.4.10: Percentage of institutionalized elderly subjects showing prevalence of degree of anemia before intervention

Hemoglobin levels Gm / dl	Males (n=12) %	Females (n=6) %	Total (n=18) %
Moderate anemia 7 – 9.9	8.3(1)	---	5.5(1)
Mild anemia 10 – 11.9	58.3(7)	83.3(5)	66.6(12)
Normal > 12	33.3(4)	17(1)	27.7(5)

Figures in the parenthesis denote number of subjects.

Table 4.4.10 reported that around 8% of the male subjects were falling in the moderate category (hemoglobin 7 to <10 gm/dl) of anemia, whereas none of the female were found in the moderate category. Majority (83.3%) of female and more than half elderly male subjects were found to be in the mild category of anemia. Only 17% female and 33.3% male subjects were found to have normal levels with hemoglobin levels > 12gm/dl. Higher prevalence of anemia could be due to the economic limitation and poor diet planning in the institution where foods rich in iron like green leafy vegetables and fruits were rarely served in the daily diet of the subjects.

(b) Serum total protein values:

Serum total protein values were further categorized and data obtained is presented in table 4.4.11.

Table 4.4.11: Percent of institutionalized elderly subjects falling under normal and below normal serum total protein values

Serum total protein (gm / dl)	Total (n=18) %
Below normal < 6 gm / dl	16.6 (3)
Normal 6 – 8 gm / dl	83.3 (15)

Figures in the parenthesis denote number of subjects.

Table 4.4.11 shows that 16.6% of the subjects had serum total protein levels less than 6 gm/dl, while 83% subjects were found in the normal range.

(c) Lipid profile:

The mean lipid profile values of the subjects before intervention are reported in table 4.4.12.

Table 4.4.12: Mean lipid profile values of the institutionalized elderly before intervention

SR. NO.	LIPID PARAMETERS	*NORMAL VALUES (mg / dl)	TOTAL (n=18) MEAN ± SD
1.	Total cholesterol (mg/dl)	160 - 200	173.05 ± 23.68
2.	Triglycerides (mg/dl)	60 - 170	125.88 ± 11.69
3.	High density lipoprotein (mg/dl)	45 - 55	37.83 ± 2.79
4.	Very low density lipoprotein (mg/dl)	---	25.11 ± 2.34
5.	Low density lipoprotein (mg/dl)	<130	108.44 ± 24.11
6.	TC / HDL	<3.5	4.54 ± 0.62
7.	LDL / HDL	<2.5	2.83 ± 0.63

***Source: NCEP-ATP III Guidelines**

As per table 4.4.12, the mean total cholesterol and triglyceride values lie in the normal range. The HDL–C, was found low compared to the normal range. Though the LDL-C was in the normal levels, due to low levels of HDL-C the fractions showed abnormal results.

Cardio-vascular diseases are the major causes of morbidity, mortality and disability in the elderly in the affluent parts of the world. Gotto (1990) in his study on changing trend in the dietary habit in Japan reported change in the dietary pattern that increased the serum cholesterol levels and the incidence of vascular diseases in men after the age of 40 years. Author further concluded that this trend kept on increasing with the advancing age.

Percentage of institutionalized elderly falling under normal and abnormal lipid profile values are presented in table 4.4.13.

Table 4.4.13: Percent of institutionalized elderly with normal and abnormal lipid profile before intervention (n=18)

TC		TG		HDL		LDL		TC/HDL		LDL/HDL	
160-200 %	>200 %	60-170 %	>170 %	<45 %	45-55 %	<130 %	≥130 %	<3.5 %	≥3.5 %	<2.5 %	≥2.5 %
89(16)	11(2)	100(18)	---	100(18)	---	72(13)	28(5)	5.5(1)	94.5(17)	28(5)	72(13)

Figures in the parenthesis denote number of subjects.

From table 4.4.13 it could be observed that 89% of the subjects fall under the normal total cholesterol values while all the subjects had normal triglyceride values. Hundred percent subjects had below desirable values for HDL-C and 28% subjects had abnormal LDL-C values.

(d) Blood glucose levels:

The mean blood glucose levels of the institutionalized elderly were found to be 109mg/dl, which was falling under the normal range. Three institutionalized elderly were found with higher blood glucose level which ranged from 150-172mg%.

(e) Blood pressure measurements:

The mean systolic blood pressure of the institutionalized elderly (n=18) was 154±18 mmHg and diastolic blood pressure was 90±10mmHg. Data when further analyzed it was found that 5 elderly had higher blood pressure of 190/110mmHg.

5. Morbidity profile

Under the morbidity profile, various parameters like major health problems pertaining to various systems of the body, psychological problems, minor illnesses and factors related to mental health of the institutionalized elderly subjects were studied. The findings are as follows.

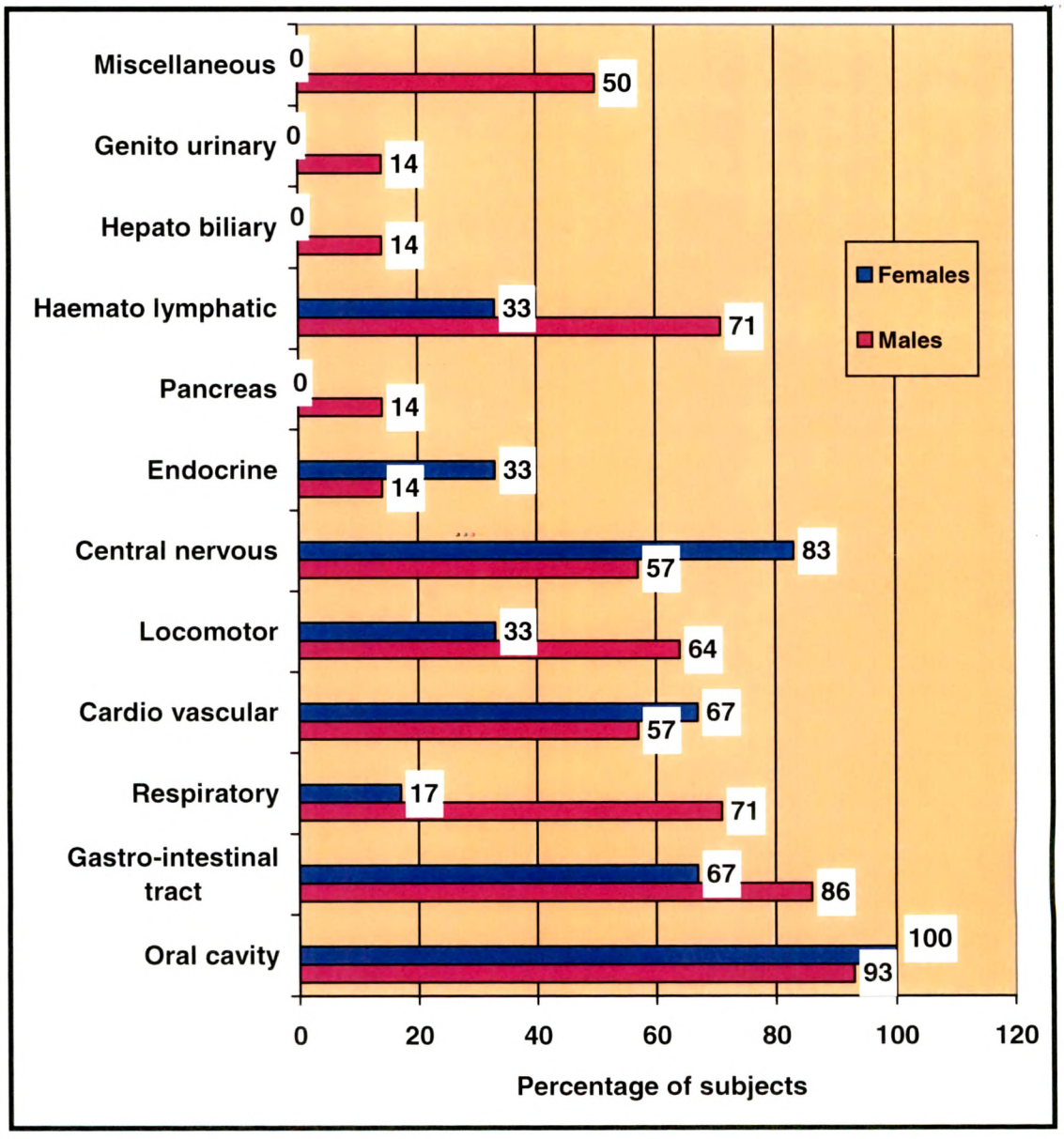
Using exhaustive checklist method information regarding disease profile was collected. Prevalence of different diseases has been shown in the table 4.4.14 and figure 4.4.1.

Table 4.4.14: Percentage of institutionalized elderly male and female subjects showing major disease profile

Sr. No.	Problems	Males n=14	Females n=6	Total n=20
1.	Oral cavity	93(13)	100(6)	95(19)
2.	Gastrointestinal	86(12)	67(4)	80(16)
3.	Respiratory	71(10)	17(1)	55(11)
4.	Cardio vascular	57(8)	67(4)	60(12)
5.	Locomotor	64(9)	33(2)	55(11)
6.	Central nervous	57(8)	83(5)	65(13)
7.	Endocrine	14(2)	33(2)	20(4)
8.	Pancreas	14(2)	---	10(2)
9.	Haemato- lymphatic	71(10)	33(2)	60(12)
10.	Hepato biliary	14(2)	---	10(2)
11.	Genito urinary	14(2)	---	10(2)
12.	Miscellaneous	50(7)	---	35(7)

Figures in the parenthesis denote number of subjects.

Figure 4.4.1: Disease profile of the institutionalized elderly subjects



From the table 4.4.14 and figure 4.4.1, it can be seen that the more problems related to oral cavity were found amongst majority of the elderly male and all the female subjects. These problems included difficulty in chewing due to either missing teeth or denture. Problems of gastro-intestinal tract ranked second followed by respiratory problems in the elderly male subjects (71%) and central nervous system problem among elderly female (83%). Overall picture shows that number along with prevalence of problems were more found in elderly male compared to elderly female.

In a departmental study by Mehta and Parikh (1991) on 50 subjects aged 50 – 58 years found that the common problems were of digestive system, cardio vascular system and dentures. A study by Pathak et al (1997) on 449 subjects aged 60 – 94 years reported the disease of cardio vascular to be the most common, followed by the problems of gastro-intestinal tract, locomotor and respiratory problems.

In another departmental study attempt was made to understand the health and nutritional status of geriatric male population (60 – 70 years) belonging to middle and higher income group of Vadodara city. It was observed that the prevalence of oral cavity problems was highest followed by gastro-intestinal, neurological, cardiovascular and respiratory problems (Mehta P, 1999).

Table 4.4.15. shows the data on the use of external aids by the institutionalized elderly.

Table 4.4.15: Percentage of elderly institutionalized subjects using various prosthetic aids

Sr. No.	Prosthetic aids	Males (%) n=14	Females (%) n=6	Total (%) n=20
1.	Hearing aid	---	---	---
2.	Stick	28(4)	---	20(4)
3.	Glasses	71(10)	100(6)	80(16)
4.	Dentures	---	17(1)	5(1)
5.	Inhalers	---	---	---

Figures in the parenthesis denote number of subjects.

Table 4.4.15, reveals that 80% of the subjects were using spectacles, followed by use of stick for the support while walking by 20% and only 5% of the subjects were using dentures. A study on 50 institutionalized and 50 non- institutionalized elderly above 60 years of age living in Vadodara city revealed the similar trend that is 89% of the subjects were using spectacles, which was followed by use of dentures (41%) and walking stick by 19% subjects (Limaye, 1999). This is supported by the findings of Kikani (1993), that majority of the elderly subjects were noted to be using spectacles and only one fourth of the subjects used dentures.

The psychological profile of the subjects was gathered with the help of a questionnaire (Clinical interview for Depression- See appendix IV). This gave a clear-cut view of various psychological problems faced by the institutionalized elderly such as feeling of sadness, lowered self-esteem, sleeplessness, etc. The responses of the subjects are projected in table 4.4.16.

Table 4.4.16: Percentage of institutionalized elderly facing different psychological problems before intervention

Problems	Males % (n=14)	Females % (n=6)	Total % (n=20)
Sad	57(8)	50(3)	55(11)
Left out	64(9)	67(4)	65(13)
Avoid socializing	79(11)	83(5)	80(16)
Low self-esteem	71(10)	67(4)	70(14)
Irritation	57(8)	33(2)	50(10)
Lack of interest	50(7)	17(1)	40(8)
Tantrums	50(7)	17(1)	40(8)
Cry	36(5)	33(2)	35(7)
Enough sleep	71(10)	33(2)	60(12)
Difficulty in concentrating	64(9)	50(3)	60(12)
Thoughts of death / suicide	14(2)	---	10(2)

Figures in the parenthesis denote number of subjects.

The above table 4.4.16 depicted the following results on psychological problems faced by the institutionalized elderly. Around 55% of the total subjects faced persistent feeling of sadness. Feeling of being left out was observed by 65% of the elderly and 80% of subjects avoided socialization. More than double number of elderly men suffered from lowered self-esteem compared to elderly women (4). Lack of interest in the surroundings was more projected by men (50%) then women (17%). Sixty percent of subjects showed a positive response and did not complaint of sleep disturbances. Thoughts of death / suicide occurred to about 10% of the subjects.

Institutionalized elderly faces various psychological problems such as depression and negative thoughts. As per the study conducted by Morgan et. al., (1997), on 1042 male and female subjects aged 65 years and over, it was shown that physical activity contributed independently to the promotion and maintenance of psychological well being. In the institution there is feeling of unwantedness among the inmates. Though they are in a crowd because they are cooped up together there may be a feeling of resentment. Such negative thoughts lead to depression. Nagpal and Chadha (1991) and Vani, Reddy and Padmini (1989) also examined the problems of elderly females living in old age homes. They pointed out that psychological well-being of elderly female in non-institutional settings are better. Women living in old age homes were less happy, lonelier and felt economically, emotionally and socially insecure.

Morbidity profile for minor complaints was also collected separately. Data on prevalence of various common minor problems found in the institutionalized elderly male and female was collected by using check list and free listing method which is shown in table 4.4.17.

Table 4.4.17: Percentage of institutionalized elderly men and women reporting minor illnesses before intervention

SR. NO.	MINOR ILLNESSES	MALE (n=14) %	FEMALE (n=6) %	TOTAL (n=20) %
1.	Cold and cough	29(4)	33(2)	30(6)
2.	Fever	14(2)	33(2)	20(4)
3.	Infections	36(5)	50(3)	40(8)
4.	Vomiting and diarrhoea	43(6)	33(2)	40(8)
5.	Constipation	64(9)	67(4)	65(13)
6.	Indigestion	50(7)	50(3)	50(10)
7.	Body aches	71(10)	67(4)	70(14)
8.	Pain in joints	57(8)	33(2)	50(10)
9.	Dizziness	29(4)	17(1)	25(4)

Figures in the parenthesis denote number of subjects.

As can be seen from the above table, the most common illnesses experienced by elderly men and women was body aches (70%) and constipation (65%), followed by problem of indigestion which included complaints like gas, flatulence and hyperacidity. Episodes of vomiting and diarrhoea and infections (which included throat, skin and eye infections) were also high (40%) among the subjects.

The aged people had less resistance against infective diseases and in the institution all the subjects had to live together because of dormitory system and therefore the chances of cross infections were more. Though prompt medical care was available because of attached hospital in the same campus of the vridh ashram, however, it was observed that the frequency of visits to the hospital was less for minor illnesses.

Kapadia (1990) reported in a study on 55 elderly subjects that institutionalized elderly perceived their health as poor compared to those living with the family.

Factors related to mental health status were also assessed by a questionnaire that was probing few specific and relevant issues. The results are presented in table 4.4.18.

Table 4.4.18: Percentage of institutionalized elderly affected by mental health related factors in the institution

Sr. No.	Mental Health Related Factors	Males (n=14)	Females (n=6)	Total (n=20)
1.	Irritation (%)			
	Loud noise	14.2(2)	66.6(4)	30(6)
	General noise	7.1(1)	100(6)	35(7)
2.	Forgetfulness (%)			
	Past	---	16.6(1)	5(1)
	Present	21.4(3)	100(6)	45(9)
3.	Expression of feeling of anger by			
	Talking	---	33.3(2)	10(2)
	Not talking	14.2(2)	50(3)	25(5)
	Crying	14.2(2)	66.6(4)	30(6)
	Not eating	---	16.6(1)	5(1)

Figures in the parenthesis denote number of subjects.

From the above table one can understand that 35% of the elderly showed intolerance to noise in general. Moreover, it can be inferred that the present forgetfulness was higher (45%) than the past (5%). Present behavior of forgetfulness was found in all elderly females while not so in elderly male. Thirty percent of the subjects expressed the feeling of anger by crying and 25% by not talking. Subjects did not have any difficulty in passing time since all the members of the institution live together day in and day out and most of them were involved in the religious activities.

B. SOY FOOD INTERVENTION

Developed four food items made from soybeans (each containing 25gm/serving- see appendix-III) and soy roti made with incorporation of 20% defatted soy flour were tried out on 10 free living elderly for assessing acceptability and digestive problems such as diarrhoea, constipation, flatulence and indigestion. None of the free-living elderly as well as institutionalized elderly subjects reported any problems and one serving was accepted easily.

Four different soy items were prepared as described in appendix-III-C. It was ensured that daily each subject consumed soy item which contained 25gms of soybean every morning at around 8.30 a.m. in their breakfast as a supplement.

C. POST INTERVENTION STUDY

Keeping in mind all the emerging studies on health benefits of soybean, intervention using soy food items was planned for a period of three months in the institution to study its effect on the health and nutritional status of the institutionalized elderly.

Four soy items that contained 25 gm of soybean and soy roti (1-4 in number) provided around 17 – 23gm of protein per day in the diet of the institutionalized elderly. Since the subjects under study were all elderly (80% were above 70years), more than 17 – 23gm of soy may lead to digestive problem or any other side effect. Hence the amount of soybeans was restricted to 25gm per serving (10.8gm of soy protein). Soy roti provided additional soy protein. All subjects consumed soy protein in the range of 14-23gms.

The nutritive value of all soy based items as well as soy roti was calculated (Nutritive value of Indian Foods, NIN, 1994). Figures are shown in appendix-IV-A.

The meal pattern of the institution during the intervention is shown in the table 4.4.19.

Table 4.4.19: The meal pattern of the institutionalized subjects

MEAL PATTERN
***Early morning*: Tea**
***Breakfast*: Soy food (equivalent to 25gms raw Soybean)**
***Lunch*: Soy Roti (20% defatted soy flour)** **Tuver dal / mug dal** **Rice** **Potato veg/Potato & Brinjal/ Cauliflower/ Papdi/ Doodhi**
***Snack*: Tea and Biscuits**
***Dinner*: Soy Roti (20% defatted soy flour)** **Chole/ Lentils/ OR** **Potato gravy and Khichadi- Kadhi**
***Bed Time*: Milk**

From table 4.4.19 it can be seen that vegetables were served in the limited amounts and fruits were not provided daily in the institution. Breakfast was not provided and hence there was a long time period between the morning tea and lunch. Therefore soy foods were given as a supplement in breakfast and soy roti in two major meals. Thus the food items prepared from soybeans were included to suit their dietary pattern.

The intervention with the soy food items was carried out for a period of three months. Post intervention data was collected on nutritional status, clinical parameters like, hemoglobin, serum total protein, lipid profile, blood glucose estimation and blood pressure. Assessment of this parameters were repeated during post data collection for twice i.e. once after six weeks of intervention and second time on completion of the intervention programme at the end of three months.

The results obtained are presented and discussed as follows:

1. Impact of Soy foods supplementation on the Nutritional Status

Assessment of nutritional status included parameters like anthropometric measurements and dietary intake.

(a) Anthropometric measurements:

Anthropometric measurement included height, weight, MUAC and BMI of all the institutionalized elderly after 6 weeks and 3 months of intervention with soy foods supplementation. Table 4.4.20 shows the results of anthropometric measurements of the institutionalized elderly subjects after six weeks and three months of supplementation of soy foods.

Table 4.4.20 : Mean anthropometric measurements of institutionalized elderly subjects before and after intervention at 6 weeks and at the end of 3 months

		Initial	Initial	6 weeks	6 weeks	3 months	3 months	6 weeks	3 months
SR. NO.	INDICES	MALES (n=12) MEAN ± SD	FEMALES (n=6) MEAN ± SD	MALES (n=12) MEAN± SD	FEMALES (n=6) MEAN ± SD	MALES (n=12) MEAN ± SD	FEMALES (n=6) MEAN ± SD	't' value M F	't' value M F
1.	Height (m)	1.60 ± 0.06	1.46 ± 0.04	1.60 ± 0.06	1.46 ± 0.04	1.60 ± 0.06	1.46 ± 0.04	--- ---	--- ---
2.	Weight (kg)	53.08 ± 13.79	44.83 ± 9.26	54.82 ± 14.2	45.10 ± 9.65	54.93 ± 14.63	46.98 ± 10.0	-3.1* -0.56	-4.01** -4.86**
3.	MUAC (cm)	25.83 ± 4.78	24.50 ± 3.61	26.12 ± 4.60	24.62 ± 3.65	26.66 ± 5.05	24.75 ± 3.63	-1.8* -1.09	-2.06** - 0.62
4.	BMI(kg/ m^2)	20.62 ± 5.60	20.41 ± 3.63	21.17 ± 5.77	20.59 ± 3.92	21.35 ± 5.99	21.38 ± 3.86	-3.39* -0.56	-4.15** - 5.6**

***Significant at p< 0.05 between initial and 6 weeks**

****Significant at p< 0.05 between initial and 3 months**

It can be summarized from the above table that there was a significant difference ($p<0.05$) found in the anthropometric measurements before and after intervention with respect to weight and BMI of the elderly males. Improvement in weight of the institutionalized elderly male was seen from 53.08kg to 54.82 kg with the mean change in body weight was about 1.4kg in first 45 days and further increased up to 54.93 kg with mean change of 1.76 kg increase in 3 months period. BMI showed

improvement from 20.62kg/m^2 to 21.35kg/m^2 in 3 months. Thus positive impact of intervention on the nutritional status of the institutionalized elderly male was observed. With regard to institutionalized elderly female, consistent increase in weight was seen till completion of intervention. The weight gain was around 300gms in first period of intervention i.e in 45 days, which was not significant but later on highly significant difference ($p<0.05$) was found at the end of 3 months of intervention. The weight was 44.83 kg initially which increased up to 46.98 kg, showing good impact of soy foods on the elderly female also. The improvement in BMI was also found to be significantly different ($p<0.05$, 20.41 to 21.38kg/m^2). Significant changes ($p<0.05$) differences were found in the MUAC of the elderly male compared to elderly female.

Percent prevalence of weight distribution in the institutionalized elderly was noted which is presented in table 4.4.21 and figure 4.4.2.

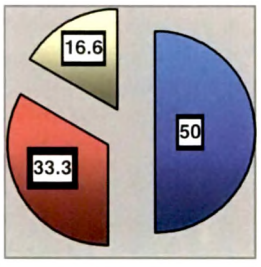
Table 4.4.21: Percent prevalence of weight distribution in the institutionalized elderly before and after intervention of six weeks and three months (n=18)

Categories	Pre (%)	Post (%) 6 weeks	Post (%) 3 months
Under weight	50(9)	33.3(6)	16.6(3)
Healthy	33.3(6)	50(9)	66.6(12)
Over weight	16.6(3)	16.6(3)	16.6(3)

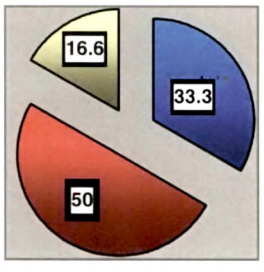
Figures in the parenthesis denote number of subjects

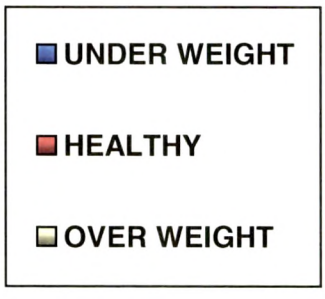
Figure 4.4.2: Percent prevalence of weight distribution in the institutionalized elderly

Before Intervention



After 6 Weeks Intervention





After 3 Months Intervention

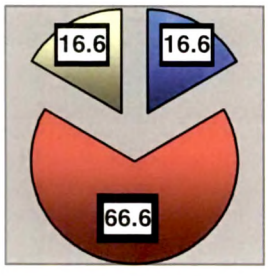


Table 4.4.21 and figure 4.4.2 revealed that percentage of healthy subjects had increased from 33.3% to 50% in 45 days, which further increased to 2/3rd number of subjects in 3 months. Similarly percentage of under weight subjects decreased from 50% to 33.3% and further to 16.6% showing the positive effect of soy foods on the health status of the elderly subjects.

(b) Dietary intake:

Dietary intake of the institutionalized elderly was taken using 24 hr dietary recall method.

Mean nutrient intake of institutionalized elderly subjects before and after 6 weeks and 3 months of intervention is shown in table 4.4.22 (a) and (b).

Table 4.4.22(a): Mean nutrient intake of institutionalized elderly male before and after 6 weeks and at the end of 3 months of intervention (n=12)

SR. NO.	NUTRIENTS	RDA	BEFORE INTERVENTION MEAN ± SD	AFTER 6 WKS INTERVENTION MEAN ± SD	AFTER 3 MTHS INTERVENTION MEAN ± SD	't'VALUE 6 WEEKS	't'VALUE 3 MONTHS
1.	Energy (Kcal)	1750	1711 ± 515	2092 + 528	2074 ± 499	-10.22*	- 9.72*
2.	Protein (gm)	60	47.89 ± 11.20	70.73 + 13.26	68.64 ± 16.80	-6.45*	- 5.76*
3.	Fat (gm)	30	70.86 ± 21.74	89.59 + 21.68	86.34 ± 17.74	-5.97*	- 5.18*
4.	Fibre (gm)	20	4.44 ± 2.16	10.80 + 3.70	10.40 ± 3.80	-8.52*	- 8.46*
5.	Calcium (mg)	400	472 ± 160	534 + 115	627 ± 131	-3.12*	- 3.89*
6.	Iron (mg)	30	20.63 ± 4.47	26.22 + 4.77	28.49 ± 4.56	-7.98*	- 8.45*
7.	β-carotene (μg)	3000	581 ± 102	800 + 137	874 ± 155	-7.32*	- 7.96*
8.	Vitamin-C (mg)	40	28.83 ± 18.26	33.37 + 17.87	37.19 ± 18.92	-5.98*	- 7.35*

*Significant at $p \leq 0.05$

Table No. 4.4.22(b): Mean nutrient intake of institutionalized elderly female before and after 6 weeks and at the end of 3 months of intervention (n=6)

SR. NO.	NUTRIENTS	RDA	BEFORE INTERVENTION MEAN ± SD	AFTER 6 WKS INTERVENTION MEAN ± SD	AFTER 3 MTHS INTERVENTION MEAN ± SD	't'VALUE 6 WEEKS	't'VALUE 3 MONTHS
1.	Energy (Kcal)	1350	1420 ± 302	1764 ± 314	1854 ± 452	-4.98*	- 5.46*
2.	Protein (gm)	50	44.96 ± 11.39	67.11 ± 12.34	68.00 ± 11.94	-37.01*	- 37.82*
3.	Fat (gm)	30	66.93 ± 20.29	83.70 ± 20.06	81.33 ± 14.43	-5.56*	- 5.78*
4.	Fibre (gm)	20	3.74 ± 0.8	8.60 ± 1.61	9.19 ± 1.3	-17.49*	- 17.61*
5.	Calcium (mg)	400	383 ± 45	599 ± 245	626 ± 186	-3.01*	- 3.07*
6.	Iron (mg)	28	17.54 ± 3.48	22.64 ± 3.65	24.22 ± 3.11	-20.57*	- 22.36*
7.	β-carotene (μg)	3000	618 ± 107	841 ± 114	908 ± 183	-6.06*	- 6.40*
8.	Vitamin-C (mg)	40	26.11 ± 12.76	30.11 ± 12.76	32.47 ± 12.50	-8.68*	- 9.88*

* Significant at $p \leq 0.05$

The above table 4.4.22 (a & b) showed a rise in all the mean nutrient intake of elderly male and female in the institution. Especially good increase in the intake of deficient nutrients like protein, fibre, iron, β-carotene and vitamin-C was observed. This proved that addition of soy feeds in the diet helped in the improvement of the nutritional status of the elderly. Significant increase in the intake of all nutrients ($p<0.05$) was observed when intake was compared between before and after intervention with soy food supplementation. Peak rise was observed in the intake when data was collected at the end of 6 weeks. Therefore the picture remained the same with slight changes in the intake of nutrients at the end of 3 months. Increase in intake of all nutrients with increase in period of intervention except for fat was found in institutionalized females. In case of institutionalized male, it was found that there was slight decrease in intake of energy, protein, fat and fibre. Mehta and Manimala (1996) conducted an intervention study on the use of ARF (Amylase Rich Food) in feeding hospitalized geriatric patients. Findings of the study showed that the amount of gruel consumption with ARF was 59% higher than the one without ARF. Similar finding was reported by Mehta and Reddy (1997) among elderly hospitalized head and neck cancer patients whose diets were modified with the use of ARF.

The percent of institutionalized elderly subjects consuming different nutrients at various levels of RDA before and after intervention is summarized in table 4.4.23 and figure 4.4.3 (a, b, c, d and e).

Table 4.4.23: Nutrient intake as percent RDA of institutionalized elderly before and after 6 weeks and at the end of 3 months of intervention (n=18)

	BEFORE INTERVENTION				AFTER 6 WEEKS OF INTERVENTION				AT THE END OF 3 MONTHS OF INTERVENTION			
NUTRIENTS	**≤50**	**51-75**	**76-100**	**>100**	**≤ 50**	**51 - 75**	**76 - 100**	**>100**	**≤50**	**51-75**	**76-100**	**>100**
Energy (Kcal)	5.6(1)	5.6(1)	38.9(7)	50(9)	---	5.6(1)	16.7(3)	77.8(14)	---	5.6(1)	16.7(3)	77.8(14)
Protein (gm)	5.6(1)	22.2(4)	61.1(11)	11.1(2)	---	---	22.2(4)	77.8(14)	---	11.1(2)	16.7(3)	72.2(13)
Fat (gm)	---	---	---	100(18)	---	---	---	100(18)	---	---	---	100(18)
Fibre (gm)	89(16)	11.1(2)	---	---	44.4(8)	44.4(8)	11.1(2)	---	33.3(6)	61.1(11)	5.6(1)	---
Calcium (mg)	---	---	50(9)	50(9)	---	5.6(1)	---	94.4(17)	---	---	---	100(18)
Iron (mg)	16.7(3)	61.1(11)	22.2(4)	---	---	38.9(7)	50(9)	11.1(2)	---	11.1(2)	72.2(13)	16.7(3)
β-carotene (μg)	100(18)	---	---	---	100(18)	---	---	---	100(18)	---	---	---
Vitamin-C (mg)	44.4(8)	16.7(3)	11.1(2)	27.8(5)	22.2(4)	27.8(5)	22.2(4)	27.8(5)	16.7(3)	33.3(6)	16.7(3)	33.3(6)

Figure in the parenthesis denote number of subjects.

Figure 4.4.3(a): Percentage of subjects showing consumption of energy as percent RDA before and after 6 weeks and at the end of 3 months of intervention

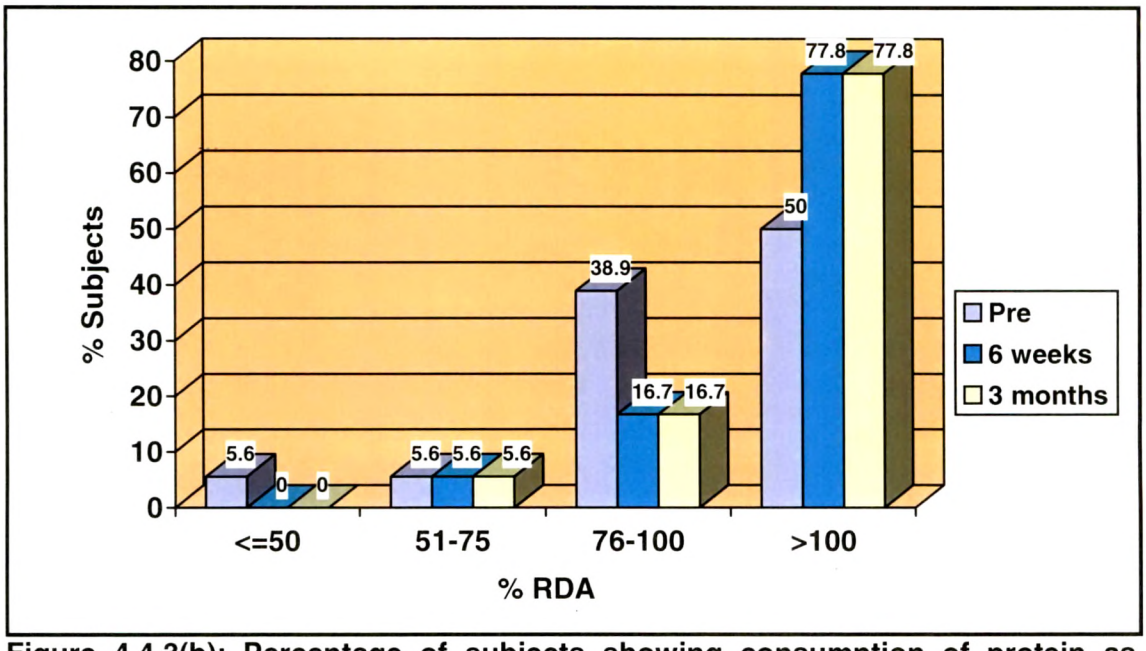


Figure 4.4.3(b): Percentage of subjects showing consumption of protein as percent RDA before and after 6 weeks and at the end of 3 months of intervention

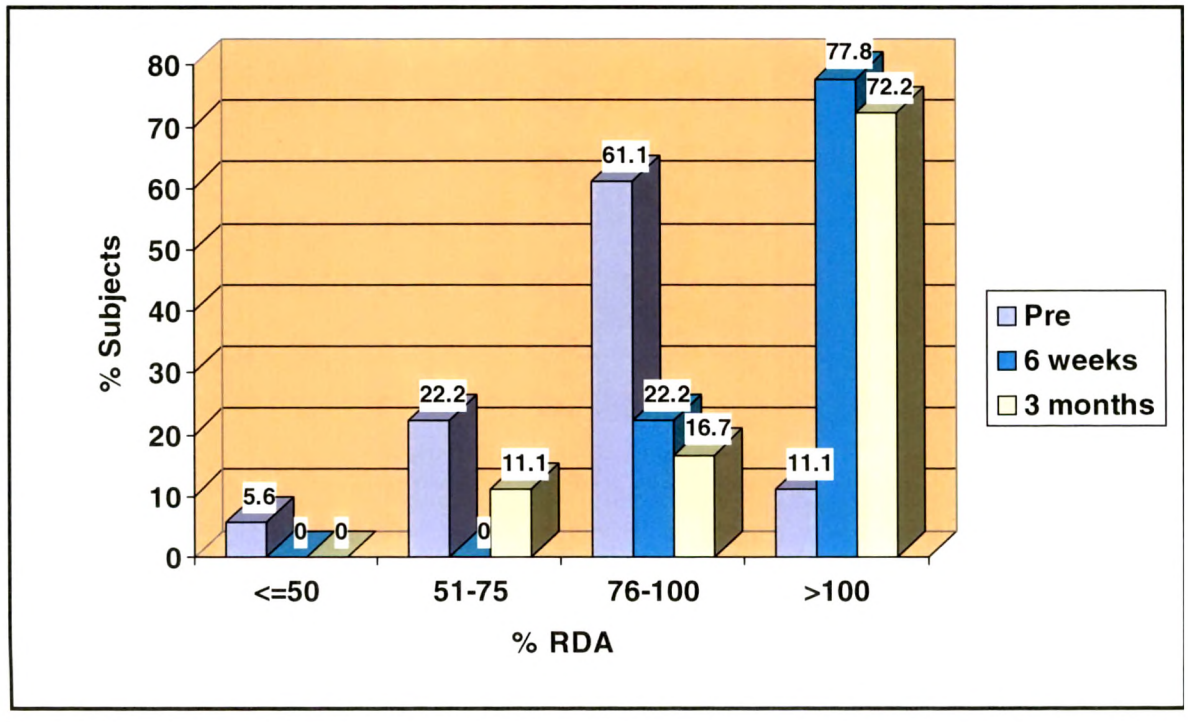


Figure 4.4.3(c): Percentage of subjects showing consumption of calcium as percent RDA before and after 6 weeks and at the end of 3 months of intervention

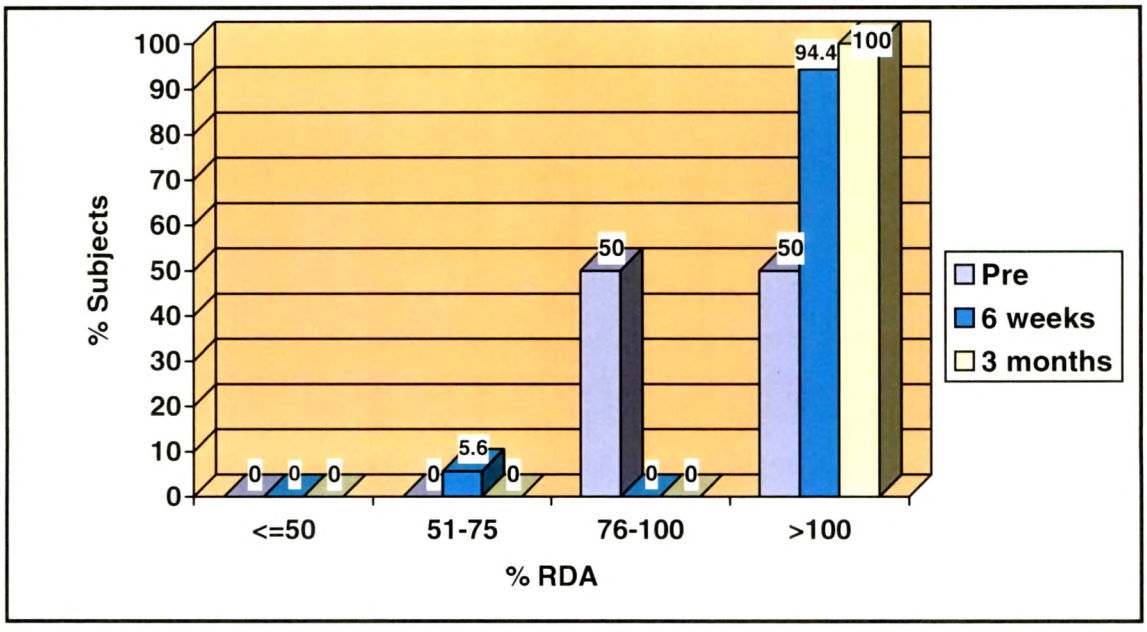


Figure 4.4.3(d): Percentage of subjects showing consumption of iron as percent RDA before and after 6 weeks and at the end of 3 months of intervention

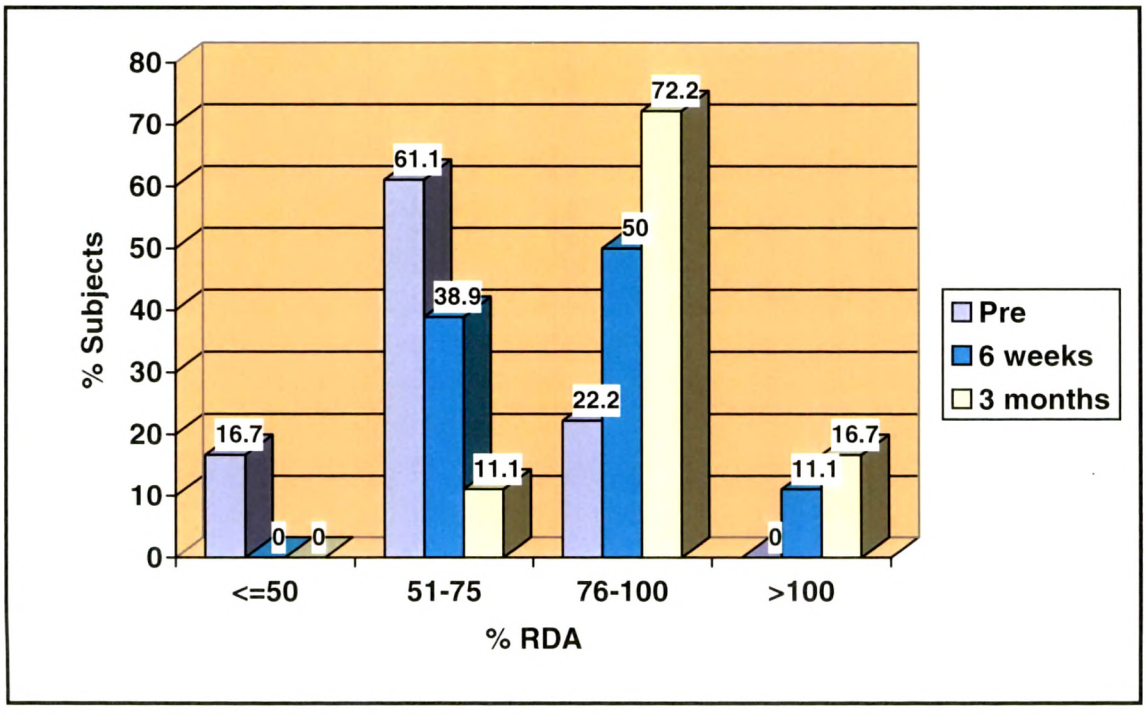
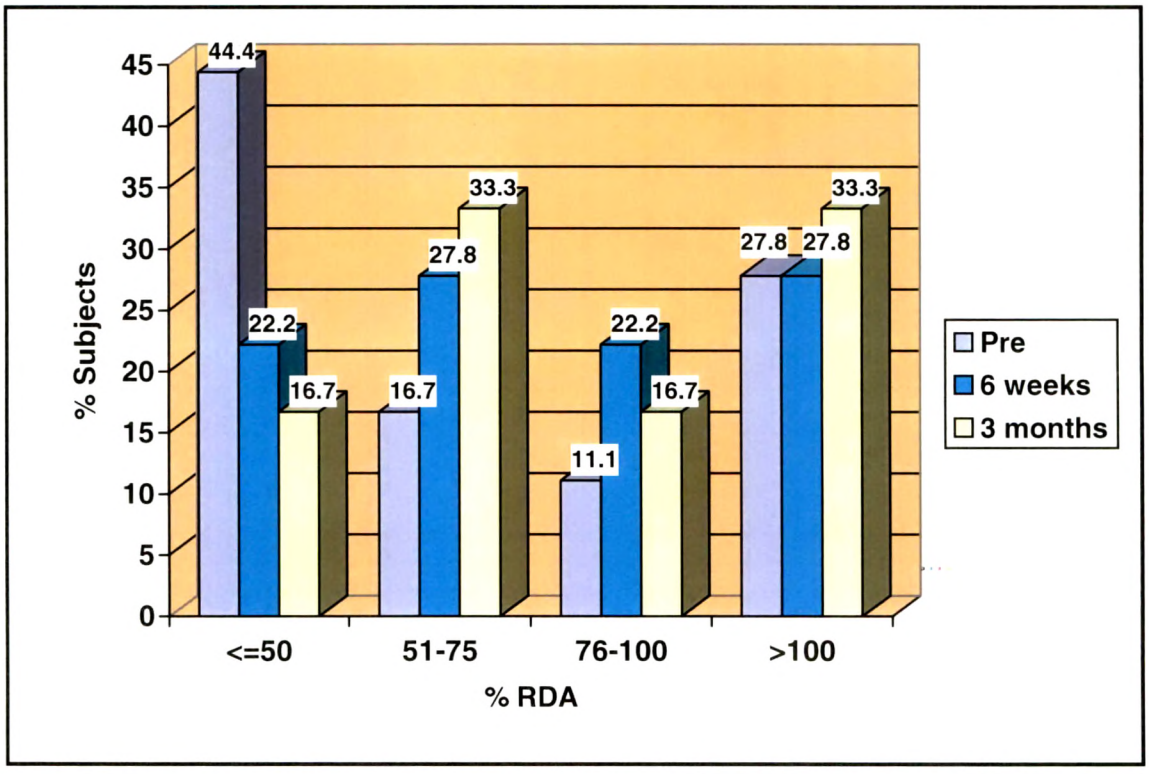


Figure 4.4.3(e): Percentage of subjects showing consumption of vitamin C as percent RDA before and after 6 weeks and at the end of 3 months of intervention



From the above table 4.4.23, it can be concluded that supplementation of soy foods did show its positive impact on the nutritional status, lowering the deficiency levels of the nutrients in the diet of the institutionalized elderly which were found grossly deficient before intervention. Improvement was seen in case of energy, protein, fibre, iron and vitamin-C. In case of β-carotene intake not much change was observed, that might be due to lack of food sources in the diet. Twenty-eight percent of subjects were consuming less than 76 % of RDA for protein before intervention moved into >75% range of RDA depicting the role of soy in the diet. Similarly improvement was observed in iron (>90% subjects consumed >75% of RDA) and calcium (100% subjects consumed >100% of RDA) intake also. Rest of the subjects were found in the category of 76-100% of RDA (72.2%) and >100% of RDA (16.7%). With respect to vitamin C little improvement was observed but in less percentages.

2. Clinical parameters:

Assessment of clinical parameters included indices like hemoglobin levels, serum total protein, lipid profile, blood glucose and blood pressure measurement of the institutionalized elderly at 6 weeks and 3 months of intervention with soy food supplementation.

(a) Hemoglobin and serum total protein levels:

The mean hemoglobin and serum total protein values of institutionalized elderly subjects studied before and after 6 weeks and 3 months of soy supplementation are shown in table 4.4.24.

Table 4.4.24: Mean hemoglobin and serum total protein values of institutionalized elderly subjects before and after intervention (mean ± SD)

PARAMETERS	BEFORE INTERVENTION		AFTER INTERVENTION OF 6 WEEKS		't' VALUE		AFTER INTERVENTION OF 3 MONTHS		't' VALUE	
	Male (n=12)	Female (n=6)	Male (n=12)	Female (n=6)	Male	Female	Male (n=12)	Female (n=6)	Male	Female
Haemoglobin (gm/dl)	11.20 ± 1.34	11.7 ± 0.60	11.58 ± 0.5	11.75 ± 0.5	- 4.17*	---	11.79 ± 0.8	12.06 ± 0.2	- 2.94*	- 1.96
Normal values	14	12	14	12			14	12		
Serum total protein (gm/dl)	6.7 ± 0.65	6.46 ± 0.54	6.77 ± 0.44	6.5 ± 0.5	0.03	0.34	6.85 ± 0.50	6.70 ± 0.34	- 1.03	0.54
Normal values	6-8	6-8	6-8	6-8			6-8	6-8		

* Significant at $p < 0.05$

Findings from the table 4.4.24 showed significant difference ($p<0.05$) in the hemoglobin levels of the male elderly subjects after 6 weeks as well as 3 months. Significant differences were not found in the hemoglobin levels of female elderly subjects but improvement in the levels were found (11.7 to 12.06gm/dl).

Murray-Kolb et al (2003) conducted a study on 18 adult women with marginal iron deficiency. The subjects consumed meal with labeled iron soybeans as soups and muffins. A significant increase in iron levels of 27% subjects was noted after 14 days and 28 days of consumption ($p<0.05$).

Significant changes were not observed in serum total protein values of all the institutionalized elderly. The values were found to be in normal range from the beginning only.

Table 4.4.25 and figure 4.4.4 depicts the prevalence of degree of anemia among institutionalized elderly before and after 3 months of intervention.

Table 4.4.25: Percentage of institutionalized elderly subjects showing prevalence of degree of anemia before and after three months of intervention

HEMOGLOBIN LEVELS (gm/dl)	BEFORE INTERVENTION			AFTER 3 MONTHS INTERVENTION		
	MALES (N=12)	FEMALES (N=6)	TOTAL (N=18)	MALES (N=12)	FEMALES (N=6)	TOTAL (N=18)
Moderate anemia 7 – 9.9	8.3 (1)	---	5.5(1)	---	---	---
Mild anemia 10 – 11.9	58.3(7)	83.3(5)	66.6(12)	58.3(7)	50(3)	55.5(10)
Normal ≥12	33.3(4)	17(1)	27.7(5)	41.6(5)	50(3)	44.4(8)

Figures in the parenthesis denote number of subjects

Figure 4.4.4: Percentage of institutionalized elderly subjects showing prevalence of degree of anemia before and at the end of the 3 months of intervention

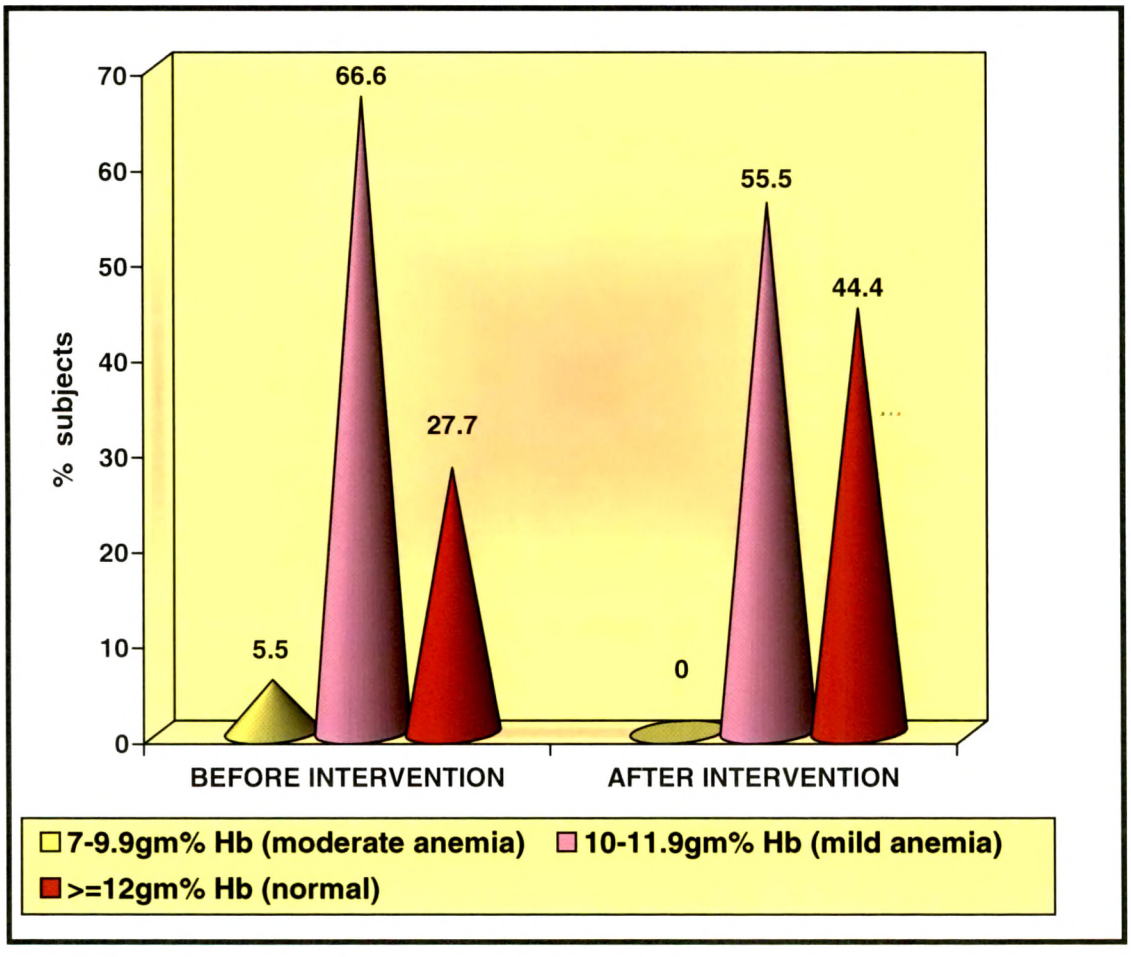


Table 4.4.25 and Figure 4.4.4 revealed that 8.3% of institutionalized elderly male were in the category of moderate anemia improved and shifted to mild category after intervention. The percentages of male subjects falling under mild category of anemia were 58.3% before and after intervention. Increase in the normal category was observed i.e. from 33.3% to 41.6%. In case of institutionalized elderly females, there was none in the moderate anemia category, whereas 83.3% of subjects under mild category of anemia shifted to 50% after intervention. Therefore increase in normal levels in total percent of female subjects after intervention was noticed.

(b) Serum total protein levels:

Attempt was made to calculate the percent of institutionalized elderly falling under normal and below normal serum total protein values before and after intervention, which is, depicted in table 4.4.26.

Table 4.4.26: Percent of institutionalized elderly falling under normal and below normal total serum protein values before and after intervention of 3 months (n=18)

SERUM TOTAL PROTEIN GM/DL	BEFORE INTERVENTION	AFTER INTERVENTION
<6	16.7(3)	---
>6	83.3(15)	100(18)

Figures in the parenthesis denote number of subjects

Though table 4.4.26 showed the mean serum total protein values of the institutionalized elderly falling under the normal range, it became evident from the table that 1/6th of subjects were found in the below normal range and remaining 5/6th number of subjects in the normal range. The improvement in the levels could be due to the supplementation of soy foods for the period of three months.

(c) Lipid profile:

Soy has proved to be hypo-cholesterolemic as per cited literature. Therefore it was thought worthwhile to assess the lipid profile of the subjects during and after 3 months of intervention with soy foods.

The mean values for the lipid profile of institutionalized elderly subjects studied before and after 6 weeks and 3 months of intervention is presented in table 4.4.27.

Table 4.4.27: Mean values of the lipid profile of institutionalized elderly before and after intervention for 6 weeks and at the end of three months (n=18)

SR. NO.	PARAMETERS	INITIAL MEAN ± SD	6-WEEKS INTERVENTION MEAN ± SD	3 MONTHS INTERVENTION MEAN ± SD	't' value 6 wks	't' value 3 mths
1.	TC (mg/dl)	173.05 ± 23.68	171.77 ± 19.88	170.94 ± 17.32	0.59	0.78
2.	TG (mg/dl)	125.88 ± 11.69	125.66 ± 10.53	127.77 ± 10.27	0.46	- 1.72
3.	HDL (mg/dl)	37.83 ± 2.79	40.22 ± 1.80	41.83 ± 2.20	- 5.78*	- 6.73**
4.	VLDL (mg/dl)	25.11 ± 2.34	25.05 ± 2.20	24.88 ± 2.47	-0.44	0.51
5.	LDL (mg/dl)	108.44 ± 24.11	106.33 ± 20.04	104.66 ± 18.16	1.46	1.70**
6.	TC/HDL	4.54 ± 0.62	4.27 ± 0.47	4.12 ± 0.42	4.26*	4.41**
7.	LDL/HDL	2.83 ± 0.63	2.65 ± 0.48	2.52 ± 0.44	2.80*	3.42*

- **Significant at p≤0.05 between initial and 6 weeks**
- **Significant at p≤0.05 between initial and 3 months**

The table depicting values of lipid profile showed an effect of supplementation on the total cholesterol, HDL-C and LDL cholesterol. There was decrease in total cholesterol and LDL-C found after 6 weeks as well as 3 months of intervention with soy feeds where as the good cholesterol HDL-cholesterol showed the significant improvement ($p<0.05$) after the intervention. There was a significant increase in the values of HDL-C i.e. from 37.83±2.79 to 41.83±2.20mg/dl. The LDL-C values also had showed a significant reduction from 108.44±24.11 to 104.66±18.16mg/dl. Due to this decrease in the level of total cholesterol, LDL-C and significant increase in HDL-C and the significant change in the fractions of lipids were observed. Though they were not in the desirable range but significant decrease in the TC/HDL-C (4.54 to 4.27, desirable value= <3.5) and LDL/HDL (2.83 to 2.65, desirable value=<2.5) was noticed showing positive effect.

Nagata et al (1998) used the information from an annual health check-up program in Japan to study the potential relationship between soy product intake and serum total cholesterol concentrations in 1242 men and 3596 women. They found a significant trend ($P<0.001$) between increasing intake of soy products and decreasing total cholesterol concentration in both men and women.

It has been established through various studies that daily consumption of soy protein in certain amount lowers blood cholesterol level and reduces the risk of heart disease. The United States of Food and Drug Administration recognizes the cholesterol lowering effect of soy protein and permits the following claim of foods containing 6.25 gm or more soy protein/ serving: "Twenty-five gms of soy protein in a day as a part of diet which is low in saturated fat and cholesterol may reduce the risk of heart disease". A study conducted by Kurowska et al (1997) showed that in people with hypercholesterolaemia, the plasma lipid profile improved after treatment with a soy product diet. In this study HDL-C increased by 9%, LDL/HDL ratio decreased by 14% and LDL-C decreased by 11%.

(d) Blood glucose levels:

Table 4.4.28 reports the mean random blood glucose values of subjects before and after intervention.

Table 4.4.28:Mean random blood glucose levels of institutionalized elderly before and after intervention (n=18)

	Before Intervention Mean ± SD	After Intervention Mean ± SD	Paired 't' test
Blood Glucose levels (mg/dl)	109 ± 31	93 ±16	3.75*

Normal=80-140mg%, * Significant $p<0.05$.

Table 4.4.28 indicated that blood glucose levels of the subjects decreased after intervention, which showed the significant change in the levels ($p<0.05$). On further analysis on individual levels it was found that few elderly who were having higher

values than normal levels showed improvement after intervention and all the elderly were showing normal levels. Thus, this finding showed the hypoglycemic effect of soy supplementation.

(e) Blood pressure measurements:

Data on blood pressure measurements of institutionalized elderly is presented in table 4.4.29.

Table 4.4.29: Mean blood pressure measurements of institutionalized elderly before and after 3 months of intervention (n=18)

	Before Intervention mean ± SD	After Intervention mean ± SD
Blood pressure levels (mmHg)	154±16 / 90±10	138±12 / 84±8

Normal=< 140/90 mmHg

Table 4.4.29 revealed that mean blood pressure measurement of the elderly subjects were more than normal values which showed improvement after intervention. Soy supplementation must have helped in the physical and mental well being which reduced the blood pressure of the elderly.

3. Morbidity profile

Data on morbidity profile and psychosocial profile was collected at the end of the intervention period of three months for all the 20 subjects.

(a) Minor illnesses:

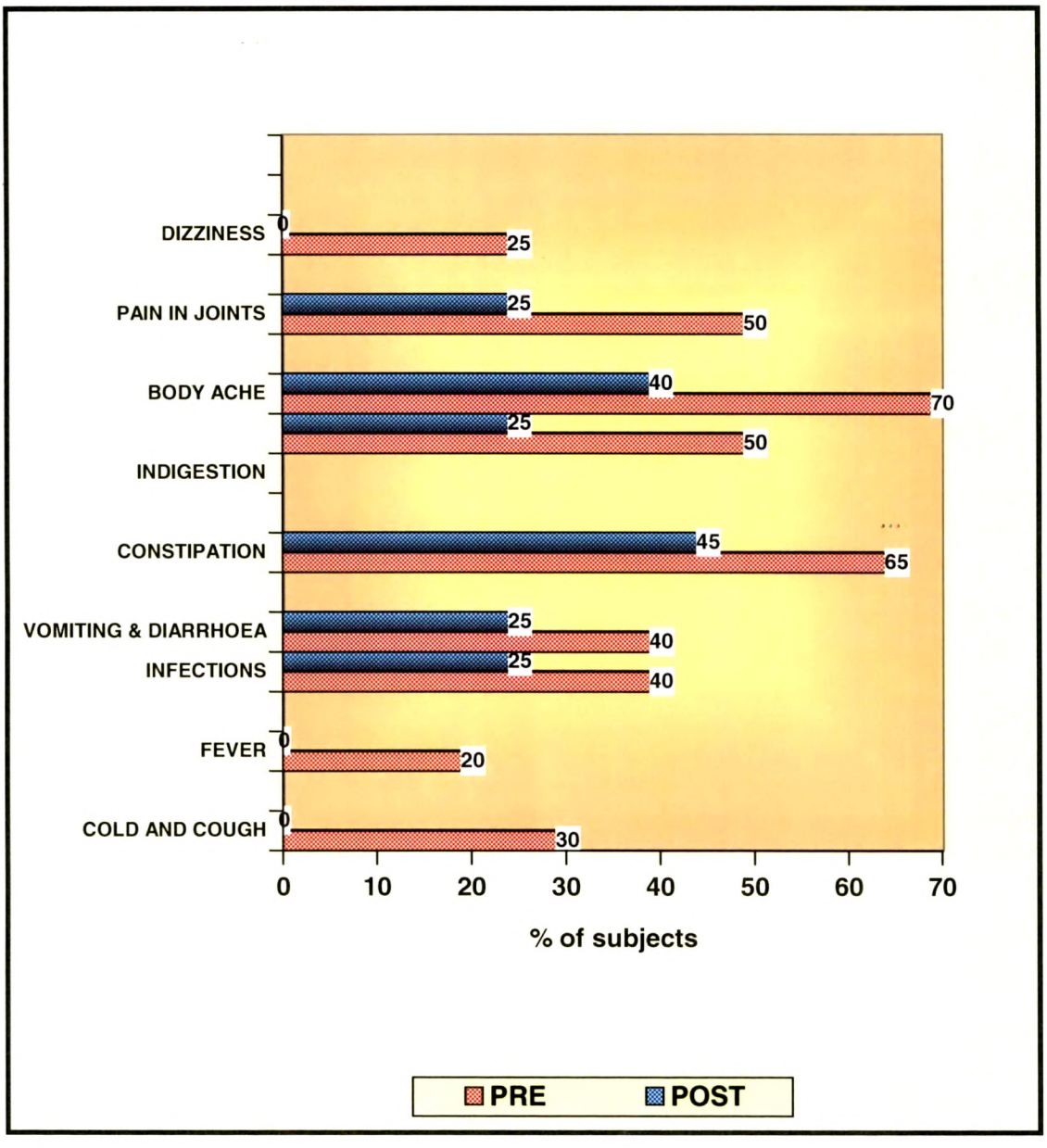
Morbidity profile for minor complaints was collected by using checklist which is shown in table 4.4.30 and figure 4.4.5.

Table 4.4.30: Percentage of institutionalized elderly men and women reporting minor illnesses before and after three months of intervention

	BEFORE INTERVENTION			AFTER INTERVENTION		
MINOR ILLNESSES	**MALES (n=14)**	**FEMALES (n=6)**	**TOTAL (n=20)**	**MALES (n=14)**	**FEMALES (n=6)**	**TOTAL (n=20)**
Cold and cough	29(4)	33(2)	30(6)	---	---	---
Fever	14(2)	33(2)	20(4)	---	---	---
Infections	36(5)	50(3)	40(8)	21(3)	33(2)	25(5)
Vomiting and diarrhoea	43(6)	33(2)	40(8)	29(4)	17(1)	25(5)
Constipation	64(9)	67(4)	65(13)	50(7)	33(2)	45(9)
Indigestion	50(7)	50(3)	50(10)	29(4)	17(1)	25(5)
Body aches	71(10)	67(4)	70(14)	43(6)	33(2)	40(8)
Pain in joints	57(8)	33(2)	50(10)	36(5)	---	25(5)
Dizziness	29(4)	17(1)	25(5)	---	---	---

Figures in the parenthesis denote number of subjects

Figure 4.4.5: Percentage of institutionalized elderly reporting minor illnesses before and at the end of three months of intervention



As can be seen from table 4.4.30 and figure 4.4.5, reduction in the percent of elderly reporting minor complaints during and after intervention was observed. The decrease in the episodes of most common illnesses experienced by institutionalized elderly men and women were body aches (70% reduced to 40%) and constipation (65% to 45%) followed by problem of indigestion, which included gas, flatulence,hyperacidity and pain in joints (50% subjects complained before reduced to 25% after intervention). Reduced complaints after intervention indicated better well-being and improvement in physical and mental status after 3 months of soy supplementation.

A study carried out by Desai M (2004) in the department of Foods and Nutrition, M. S. University of Baroda on depressed adult women (aged 40-50 years) found that minor health problems like headache (45%), feeling of tiredness (85%) and backache (55%) were higher in depressed women as compared to non-depressed women.

(b) Psychological problems:

Psychological problems related to clinical depression faced by the institutionalized elderly before and after three months of intervention are depicted in table 4.4.31 and figure 4.4.6.

Table 4.4.31: Percentage of institutionalized elderly men and women showing psychological problems before and after three months of intervention

	BEFORE INTERVENTION			AFTER INTERVENTION		
PROBLEMS	**MALE (n=14)**	**FEMALE (n=6)**	**TOTAL (n=20)**	**MALE (n=14)**	**FEMALE (n=6)**	**TOTAL (n=20)**
Sad	57(8)	50(3)	55(11)	43(6)	17(1)	35(7)
Left out	64(9)	67(4)	65(13)	29(4)	33(2)	30(6)
Avoid socializing	79(11)	83(5)	80(16)	64(9)	50(3)	60(12)
Low self-esteem	71(10)	67(4)	70(14)	43(6)	17(1)	35(7)
Irritation	57(8)	33(2)	50(10)	36(5)	17(1)	30(6)
Lack of interest	50(7)	17(1)	40(8)	29(4)	---	20(4)
Tantrums	50(7)	17(1)	40(8)	36(5)	17(4)	30(6)
Cry	36(5)	33(2)	35(7)	14(2)	33(2)	20(4)
Enough sleep	71(10)	33(2)	60(12)	93(13)	85(5)	90(18)
Difficulty in concentrating	64(9)	50(3)	60(12)	57(8)	17(1)	45(9)
Thoughts of death / suicide	14(2)	---	10(2)	7(1)	---	5(1)

Figure in the parenthesis denote number of subjects

Figure 4.4.6: Percentage of institutionalized elderly showing psychological problems before and at the end of 3 months of intervention

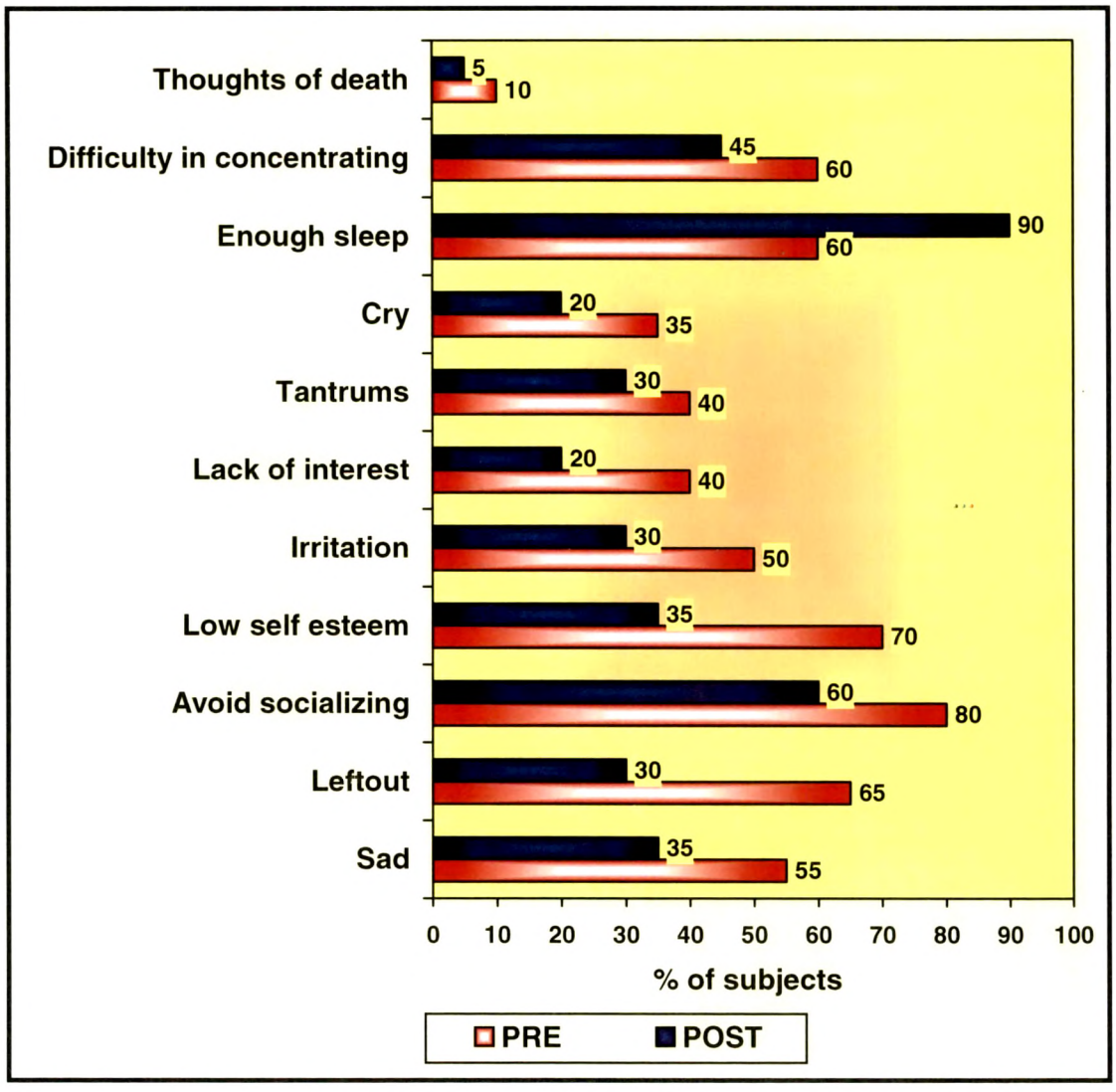


Table 4.4.31 and figure 4.4.6 showed the reduction in the percent of subjects affected by psychosocial factors. It revealed that initially 55% of the total subjects faced persistent feelings of sadness that decreased to 35%. The feeling of being left out was observed among 65% of them that reduced to 30% and 80% of subjects who avoided socializing declined to 60%. The feeling of lowered self-esteem was prominent among 70% and irritation was a common sign among 50% of the subjects, which lowered to 35% and 30% respectively. Forty percent of the subjects showed lack of interest, which reduced to half whereas 40% of them complained of sleep disturbances before intervention. This number reduced to 10% after intervention. Fifty percent of the subjects had increased their appetite. Thoughts of death/suicide occurred to about 10% of subjects, which reduced to only 5% after intervention. Thus, there was a definite change brought by Soy foods suggesting vital role of good nutrition in improving mental health also.

Thus, in this phase of the study, beneficial effects of soy intervention were observed in elderly subjects showing reduction in anemia, improvement in lipid profile and reduced morbidity after intervention. Thus, soybean seems to have good potential for elderly population.

Looking at the overall results, the present study has contributed a great deal by suggesting various approaches to promotion of sound health by the elderly. Studies of this nature can provide strong foundation for dealing with the needs of elderly in the society.

The findings of present study are summarized and concluded in the next chapter.