HEALTH STATUS AND DIETARY PRACTICES OF INSTITUTIONALIZED SENIOR CITIZENS

By

J. PARIMALA

A Thesis submitted to Avinashilingam University for Women, Coimbatore in partial fulfillment of the requirements for the award of the degree of

MASTER OF FOOD SERVICE MANAGEMENT AND DIETETICS

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Certified as Bonafide research work

Signature of the Head
of the Department

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Signature of
the Guide

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I. INTRODUCTION

“The oldest trees often bear the sweetest fruits”

-German proverb

Aging is a process of gradual and spontaneous change resulting in maturation through childhood, puberty and young adulthood and then decline through middle and late ages. The regeneration capacity of cells and other processes due to growth and maturation are lost over time, ultimately leading to incompatibility with life. Although there is no certain age, 65 years is usually accepted as the beginning of old age.

Old age occurs in all living creatures without differentiation. It is a continuous and universal process causing decrease in all functions. The average life span of people around the world has been increasing dramatically.

From 1996 to 2025, the percentage of elderly is expected to increase by 17 to 82 percent in European countries and by about 200 percent in some developing countries. By 2025, Italy and Japan are expected to have the highest proportion of people 65 years and older, accounting for nearly one-third of their population. However, developing countries such as China and India which have the world’s largest population, will continue to have the largest absolute number of elderly people (Sevgi, 2000).

In developing country like India, the elderly people suffer from the dual medical problems of both communicable as well as degenerative diseases. This is further compounded by impairments of special sensory functions like vision and hearing. The elderly are highly vulnerable to infectious diseases because of a decline in their immune functions and atrophic changes in various organs. According to Sengupta (2004) the physiological changes in the old age lead to impaired cough reflex, impaired circulation and tissue

perfusion. Further, incidence of infection remains high because of poor nutrition and high intake of immuno suppressive drugs.

According to Nelson (2006) chronic diseases and other health factors, such as malnutrition and immobility, may increase susceptibility and severity of infections, including food borne illnesses in elderly persons. Therefore, prevention is the best way to avoid food borne illnesses, but older adults have long established food preparation and handling practices, some of which may increase the likelihood of illness.

Elderly persons rely on physicians as trusted sources of health information. Physicians and other health care professionals can help to prevent and control food borne diseases by educating the patients about the risks of food borne illness by providing sound advice on safe food handling and consumption practices, making rapid appropriate diagnosis and reporting cases promptly to public health authorities.

Among infectious diseases, pneumonia is 50 times more common in the elderly than in adolescence and it accounts for half the deaths caused due to respiratory diseases, excluding cancer. Urinary tract infections are particularly common in the elderly population. A symptomatic bacteriuria affects 30 percent of elderly women and 7 percent of elderly men. The common cause of urinary tract infection in the elderly is due to insertion of catheter and other instruments (Donald 2004).

The chronic illness in the elderly usually includes hypertension, coronary heart disease and diabetes mellitus. The prevalence of hypertension was found to be higher in females, affecting as many as 323 per 1000 females in the rural areas. Coronary heart disease was found to be more common in urban areas and higher for males than females. It requires special health, nutrition and lifestyle counseling.

A study on the health care for the rural aged in Madurai district, Tamilnadu reported that out of 910 elderly screened, 88 percent had visual complaints, 40 percent had locomotion difficulties, followed by symptoms of central nervous system (14%), cardiovascular (17%), respirator (16%), dermatological (13%), gastro intestinal (10%), psychiatric (4%) and acoustic (8%), two percent of sample suffered from neoplasm. These complaints were due to inadequate intake of foods like fruits, green leafy vegetables and milk (Venkat Rao, 1999).

Sumati (2004) says that elderly individual usually face higher risk of developing mental as well as physical morbidity. Their vulnerability to mental problems is due to ageing of the brain, physical problems, socio-economic factors, cerebral pathology, emotional attitude and family structure. The biochemical and morphological changes in the ageing brain of normal individuals are similar to those suffering from dementia. In most cases, mental illness coexists along side physical problems in elderly persons. Chronic physical disorders and sensory impairments (vision and hearing defects) are known to be especially associated with mental problems of the elderly.

Vignettes of depression and dementia are widely recognized. Late life mental disorders were attributed to abuse, neglect or lack of love on the part of children towards parents. There was evidence that the system of family care and support for older people was less reliable than has been claimed. Vikram Patel (2001) says that care was often conditional upon the child's expectation of inheriting parent's property. Care for those with dependency needs was almost entirely family based with little or no formal services. Unsurprisingly, fear for future, and in particular 'dependency anxiety' was common.

In India, only a few programs or institutions currently exist to address the problems of the growing elderly population. Despite lower energy intake with age, elderly have higher requirements for several micronutrients, making

then vulnerable to deficiencies that further aggravate chronic conditions (Peace, 2001).

During recent decades, the concept of health promotion has become legitimate part of health care. Change in diet and the exercise patterns are most effective in the prevention of nutrition related conditions when they are instituted early in life, but positive effects can occur at any age. If nutritional interventions are instituted early, a substantial reduction in health care expenditures may result from a decrease in the incidence or the delayed onset of disease conditions (Ronnichernoff, 2001). Hence it is essential that the health profile of the elderly are evaluated periodically and intervention programmes are instituted for elderly. There is a great difference in the health status of the elderly living in their homes with children and those living in the institutions.

Bearing this in mind the present study has been formulated to assess the health status of the elderly living in institutions. This will further aid in planning improvement programmes and in motivating the elderly towards correct dietary practices.

The study was formulated with the following objectives:

a. Assess the food consumption pattern of selected senior citizens living in institutions.
b. Evaluate the nutritional status of senior citizens elderly living in institutions.
c. Find out the diseases prevailing in the institutionalized senior citizens.
d. Evaluate the dietary practices followed by the institutions in promoting the health of the senior citizens.

II. REVIEW OF LITERATURE

The literature pertaining to the study entitled, 'Health status and dietary practices of institutionalised senior citizens", is discussed under the following heads:

A. Health status of the elderly
B. Dietary practices of elderly
C. Nutritional status and nutritional programmes for elderly
D. Oldage homes

A. Health status of the elderly

Amir Aslani (2007) points out that aortic atheroma is present in 25 per cent of elderly patients with ischemic stroke without ceratoid artery stenosis. According to Shinji et al (2007) the isolated systolic hypertension increase with age.

Anaemia proves to be an independent predictor of death and affects elderly patients with stable symptomatic coronary artery disease (Stefano Muzzarelli, 2006). According to Daniel Burkhoff (2007) anaemia, renal dysfunction and obesity contribute to pathophysiology of heart failure normal ejection fraction among elderly population.

In Mexican Americans, heart attack was associated with ageing and also having diabetes mellitus, hypertension, stroke (Ray et al, 2003).

According to Eddy Barasch (2006) mitral annular calcification, aortic annular calcification and aortic value sclerosis are associated with cardiovascular disease among elderly. Otiniano (2003) says that diabetes and stroke are strongly associated with higher risk of disabilities among elderly Mexican Americans. According to Kartherine Gooch (2007) NSAID exposure is associated with increased risk for rapid chronic kidney disease in elderly population.

Prevalence of chronic kidney disease was common in middle and old-aged population in Beijing (Guo-Bing et al, 2006). According to Iliffe et al (2005) visual function loss increases with advancing age, and it is not associated with female sex, low educational attainment or low income. Evans (2007) says that visual impairment is more likely to experience problems with functioning, which in turn leads to depression.

According to Yaxingwang et al (2006) the age related macular degeneration and diabetic retinopathy play a minor role as a cause for visual field loss among elderly population in China. Peiyulin et al (2003) say that prevalence of dry eye was relatively higher in elderly Asian population.

Visual retinal and cortical function deteriorates by altering the functioning of both magnocellular and parvocellular visual pathways among elderly (Justino, 2001). Long term smoking is closely associated with higher risk of cerebrovascular disease that leads to vascular dementia (Maeng Jecho, 2003). Depressive symptoms are associated with long term mortality in older patients hospitalized with medical illnesses (Covinsky et al, 1999). David Johnson (2004) points out that severe erosive esophagitis is associated with heart burn as the age increases. Gehlbach (2002) says that osteoporosis or vertebral fracture in older women are being diagnosed and treated by primary care physicians.

According to Edward Castillo et al (2003) lack of physical activity and current smoking are associated with sarcopenia. Beard (2005) points out that skin disease is very common among elderly and the severity depends on patients clinical environment.

According to Asplund et al (2004) the prevalence of nocturnal polyuria syndrome is about 3 per cent in elderly population with no gender differences.

B. Dietary Practices of Elderly

Taylor (2006) says that offering five daily feedings did not improve energy intake when compared with three feeding a day.

According to Hanamori et al (2004) Japanese dietary pattern consist of high intake of energy and protein and also high consumption of fish and shellfish, vegetables and fruits provide sufficient minerals and vitamins. According to Heaney (1999) healthy aging is associated with decreased appetite and energy intake and this is associated with weight loss. According to Promslow et al (2002) increasing protein consumption appears to be more beneficial for women with low calcium intake.

Dietary intake is lower among individuals older than 75 than in 65 to 74 years old. It has been found that frequent snacking enhances the dietary intake (Shahar et al, 2003). Ortega (1996) points out that shorter length of time is being spent on eating breakfast and consumption of smaller quantities further contribute in development of obesity.

Wells (2003) suggest that the elderly men who consume either beef or vegetarian diet maintain a hematological profile within clinically normal limits during 12 weeks of resistive training.

According to Haub (2005) Lipoprotein lipid profile was affected by supplementation with beef Vs soya based foods during resistive training among elderly people. Utama Angelo (2003) points out that consumption of garlic and greentea have beneficial effect in lowering cholesterol levels among elderly. Long term regular ingestion of tea may have a favourable effect on blood pressure in older women (Hodgson 2003).

Elderly Indian population with high rates of coronary artery disease can be benefited from eating foods rich in andioxidant like vitamin A, C, E and β carotene (Ram Singh et al, 1995).

Jefferson et al (2003) points out that consumption of cooked vegetable and moderate intake of wine has been associated with decreased risk of oxidative damage among elderly.

Nelson (2003) points out that supplementation of antioxidant along with a diet high in carotenoids elevate serum carotenoids and antioxidant levels in older adults. Kaklamani et al (2000) points out that consumption of both cooked vegetables and olive oil which was inversely and independently associated with risk of rheumatoid arthritis in elderly population. According to Ledikwe et al (2006) to achieve low energy density diet the individuals should be encouraged to eat a variety of fruits and vegetables as well as low-fat or reduced fat, nutrient-dense, and/or water-rich grains, daily products and meats or meat alternatives.

According to Agudo et al (2007) that consumption of total vegetable intake and cruciferous vegetables and hence of glucosinolates is relatively low among European elderly. Addition of moderate amount of finely processed fibre to food results in increased bowel frequency in institutionalised elderly individuals (Dahl et al, 2004). Khaja (2005) says that use of fibre (blend of oats, maize, legumes, soya and apple fibre in powder form; 7g/meal twice a day) allows discontinuation of laxatives in elderly. According to Greenwood (2001) consumption of all macronutrients and trace elements enhances cognitive performance among elderly.

According to Gustafsson Ekblad (2005) dietary advice should be based on women's food preferences and habitual foods. It is important to inform

about known relations between food and disease, but also to support eating favourite foods, thereby it facilitates women's wellbeing.

Morley (2001) points out that exercise may increase food intake in older persons. According to Thomas Clausen et al (2005) higher food variety was associated with improve physical and cognitive functions.

Oldermen and their wives had positive perception about the foods although their behaviour capability was low because most of them were unaware of the recommended number of servings or the reason why their intake was important (Holmes, 2003).

C. Nutritional status and nutritional programmmes for elderly

Poor nutritional status has been associated with progression of chronic diseases among elderly population (Donini, 2002).

Husted (2007) suggests that 35 per cent of elderly patients with ischemic stroke admitted to a geriatric rehabilitation unit were malnourished one week after stroke. Acd Ziolkowska (2006) during diabetes, pathologic lesions develop in oral cavity, thereby it affects oral hygienic status. Mitsuko Takahashi (2004) says that dietary evaluation was useful and effective among elderly diabetic patients. The muscular and visceral protein levels were found to be decreased with ageing (Nakamura et al, 2006).

Shabayek (2000) points out that the institutionalised and free living elderly are at risk for developing nutrient deficiencies.

According to Gerber et al (2003), the malnutrition and osteoporosis are frequent in institutionalized elderly person in India.

Murphy et al (2000) says that the mini nutritional assessment helps in identification of elderly patients at risk of malnutrition.

Elderly people who are cared in institutional centres and those who are cared by their relatives in terms of nutritional status have greater variation reflected in their BMI levels (Nyaruhucha et al, 2004).

Micronutrient deficiencies are common and supplementation appears to overcome the deficiencies in elderly (Flood Carr, 2002).

Mortality rate was higher among elderly men with lower intake of carbohydrate, dietary fibre, vitamin B1, Vitamin B6, potassium, phosphorous, magnesium, copper, zinc and also with lower intake of total fat, saturated and mono saturated fatty acids (Kaluza, 2005).

According to Des champs et al (2002) the healthy elderly people had BMI ranging between 23 and 27 is associated with lower risks of functional and cognitive decline.

In older adults, with high or low baseline body mass index, weight, stability is associated with a lower mortality risk (Raji, 2007).

Adequate folate and cobalamin act synergistically to decrease the risk of high total plasma homocysteine levels in elderly population (Huerta et al, 2004).

Ramos et al (2004) point out that low folate status is associated with depressive symptoms in elderly Latina women but not in men.

According to Liedberg et al (2007) overweight obesity, low physical activity and high alcohol intake were more common among those with inadequate nutritional intake. Mitchell et al (2003) point out that physical activity and dietary fat intake in the elderly population were more closely associated with body fat mass than with total energy intake.

According to Nadine (2003) dental health is closely associated with nutritional status and it is necessary to consider the status of dentition during nutritional counseling and in assessment of older adults.

According to Hara (2005) vitamin E plays an important role in maintaining the immune responses among elderly.

According to Lorefalt et al (2004) weight loss was common in Parkinson's disease patients in spite of increased energy intake and decreased in cognitive function was observed. According to Sato et al (2002) functionally dependent women with Parkinson's disease, nutritional vitamin K deficiency is believed to reduce production of fully carboxylated osteocalcin causing reduced BMI.

Whayoung Kim et al (2003) point out that olfactaory dysfunction have a profound effect on food intake and the nutritional status.

Irving et al (1999) point out that educational program appeared to increase the nutritional knowledge in personnel working in the service flats. At the 6 month follow up, the nutritional status of the residents had not deteriorated.

According to Carlson (2006) high intensity volunteer program that was designed as health promotion intervention, and lead to significant improvements in the levels of physical activity of previously inactive old adult volunteers.

D. Old age homes

Care program provided by the home care centre included immediate assistance in community, nutritional assessment, crisis counseling, medication and psychiatric services were well accepted by the users (Gaillard, 2006).

Redondo et al (1996) suggest that elderly residing in homes seems to improve the quality of breakfast consumed, especially found in elderly women.

According to Estabrooks (2005) physical activity program offered to elderly was effective and had strong health impact on elderly in homes.

Inal et al (2007) say that by making the elderly to participate in physical activity and leisure time activity programs helps to improve the life satisfaction among institutionalised elderly.

According to Brown et al (2006) the essential clinical information is often missing for older adults in home care service centre. Hence the need both educational initiatives and technology to address the complex care needs of older adults in order to reduce the risk of medication errors and poor outcomes.

Krishnamurthy (2007) opined that an integrated approach of yoga including mental and philosophical aspects in addition to the physical practices was useful for institutionalized older persons.

According to Makhlouf (2007) revealed that age, gender and other socio-demographic factors are correlated with insomnia symptoms. Therefore, the health care providers should take these factors in consideration when dealing with elderly.

III. METHODOLOGY

The methodology followed in the present study entitled, "Health status and dietary practices of institutionalized senior citizens" is presented under the following heads.

A. Selection of area
B. Selection of subjects
C. Formulation of interview schedules
D. Collection of data
    1. Food and nutrient intake
    2. Anthropometric measurements
    3. Clinical examination
    4. Biochemical assessment

A. Selection of area

Three old age homes in Coimbatore city namely Neyam, Missionaries of charity and Mother care center were selected for conducting the study. These centers were selected using judgement sampling method. These institutions were chosen because of their easy access and the authorities of the homes permitted the investigator to conduct the study.

B. Selection of subjects

All the elderly residing in the three selected institutions were included in the study. Thus ten subjects from Neyam, twenty two from Mother care centre and eighteen from Missionaries of Charity were selected for the study. Totally there were fifty subjects. These subjects were in the age range of 60 to 90 years. There were 16 male and 34 female subjects. The subjects and the authorities of the institutions were very much co-operative in the conduct of the study.

C. Formulation of interview schedule

Interview schedule refers to a form of questionnaire which is generally filled in by the researcher or the enumerators who are specially appointed for the purpose (Hasouneh, 2003).

Two interview schedules were formulated by the investigator. One was developed to elicit the socioeconomic background and dietary intake of selected elderly. This included the details regarding age, sex, past occupation, educational level, and income. Apart from this, the food consumption pattern, physiological symptoms of nutritional deficiencies like mild or moderate anemia, loss of appetite, blurred vision, joint pain, weakness, bleeding gums, dental caries, mottled enamel, dryness of skin, easy pluckability of hair, and other disease conditions of the subjects were also included. Prevalence of non communicable diseases namely cardiovascular disease, diabetes mellitus, cancer and osteoporosis were also included.

Another interview schedule was formulated to collect information from administrators of the three old age homes. It included questions on the factors considered in menu planning, type and pattern of menu, methods of cooking and involvement of inmates in the food preparation. This was developed to know the dietary pattern and to know about the quality maintenance in food preparation and service. The interview schedules developed are presented in Appendix I and II.

D. Collection of data.

The data were collected using personal interview method. According to Gupta (2005) personal interview is a method of collecting data. There is a face-to-face contact with the persons from whom the information is to be obtained. By using this technique we can gather more information and that too in greater depth.

The interview method of collecting data involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses (Kothari, 2004).

Information regarding the socio-economic background, dietary pattern, medical history and life style pattern of the elderly were collected using the interview schedule. The subjects were interviewed personally by the investigator which aided in developing good rapport and was useful in ascertaining the reliability of the data as indicated in Plate I.

PLATE – I

INVESTIGATION OF INTERVIEWEE

1. Food and nutrient intake

Diet is a vital determinant of health and nutritional status of people. Information on food consumption pattern of people, through application of appropriate methodology is often needed not only for assessing the nutritional status of people but also for elucidating the relationship of nutrient intake with deficiency as well as degenerative disease (Bamji et al 1996).

The food frequency list included in the interview schedule was used to record how often various foods have been consumed in a given period of time.

The 24 hour food recall method of data collection requires the individual to remember the specific foods and amount of foods they consumed in the past 24 hours (Kant, 2002). The 24 hour food recall method for three consecutive days and fluctuations in quantity of food consumed were recorded. This method was employed for the elderly and based on this the mean food and nutrient intakes were calculated.

2. Anthropometric data

Anthropometric data namely height and weight were measured. The technique involved in the measurement is described below.

l. Measurement of height

The height of an individual is principally a measure of skeletal bone tissue. The height of the subjects was determined using a non-stretch measuring tape fixed to a vertical flat wall. After removing the shoes, the subjects were asked to standup as straight as possible on a flat floor, by the scale with feet together and with heels, buttocks, shoulders and back of the head touching the upright. The feet was bare, flat on the floor and with the heels almost together, the height of the subjects was measured from the scale accurate to 0.5 cm as shown in Plate II.

PLATE - II

MEASUREMENT OF HEIGHT

2. Measurement of weight

Body weight is the most widely used sensitive and simplest anthropometric measurement for the evaluation of nutritional status of the elderly subjects. It also provides a crude evaluation of overall fat and muscle stores (Hopkins, 1993).

The body weight was determined using a lever balance corrected to zero and the readings were noted. The subjects were made to stand on the balance erect on barefoot and readings were made to the nearest 0.5 kg. The balance was checked regularly for accuracy using standard weights as shown in Plate III.

PLATE - III

MEASUREMENT OF WEIGHT

3. Body mass index

Body mass index was calculated using the formula recommended by Garrow (1993) that recommends dividing the individual's weight (kg) by the square of height in metres.

$$\text{BMI} = \frac{\text{Weight in (kgs)}}{\text{Height in (m}^2\text{)}}$$

An international consensus on BMI states the following ranges

Body mass index	Criteria
<18	Under weight
20 - 24.9	Desirable range
25 - 29.9	Over weight
>30	Obese
>40	Very obese

This classification was used in the evaluation of the nutritional status of the elderly.

3. Clinical examination

Clinical examinations is a commonly used method for assessment of nutritional status of communities, since it is relatively simple and does not call for sophisticated equipment and helps to reveal the anatomical changes by naked eye. The subjects were clinically assessed by the investigator for symptoms of deficiency. A clinical examination form was used to assess the symptoms. The clinical assessment form used is presented in Appendix III.

4. Biochemical assessment

Bio chemical assessment yields reliable data regarding the nutritional status of the individual with respect to the nutrient intake. Important biochemical parameters namely haemoglobin, fasting blood sugar level, Triglyceride, total cholesterol, HDL, LDL, VLDL, albumin and globulin were determined for all the 50 samples. Haemoglobin level in the blood was estimated using cyanmet haemoglobin method suggested by (Varley et al, 1998). Total cholesterol, TGL, LDL, HDL, VLDL were estimated using enzymatic colorimetric test suggested by (Varley et al, 1996). Blood sugar levels were estimated by using GODPAP method suggested by Rodney (1996). Albumin and globulin were estimated by biuret and BCG dye binding method (Varley et al, 1996).

The collected data were consolidated and statistically analyzed to assess the health profiles of the selected senior citizens.

IV. RESULTS AND DISCUSSION

The results of the present investigation entitled, "Health status and dietary practices of institutionalized senior citizens", are presented under the following headings:

A. Socio-economic status of elderly in old age homes
B. Dietary practices in the selected institutions
C. Dietary pattern of the elderly
D. Anthropometric data of the elderly
E. Clinical examination of the elderly
F. Biochemical assessment of the elderly

A. Socio-economic status of elderly in old age homes

1. **Age and Gender**

The distribution of selected subjects according to age and gender is shown in Table I.

TABLE I
DISTRIBUTION OF SELECTED SUBJECTS ACCORDING TO AGE AND GENDER

Age	Male	Female	Total
60 – 70	7	15	22
70 – 80	3	12	15
80 – 90	6	7	13
Total	16	34	50

It is evident from Table I that there were more female subjects living in institutions compared to males. This trend was common in all the selected institutions. The number of elderly was more in 60 to 70 years age group compared to older groups. There were 13 elderly in the age group of 80 to 90 years. These elderly were able to do their work independently.

2. Educational status

The distribution of selected elderly subjects according to their educational status is presented in Table II.

TABLE II

DISTRIBUTION OF SELECTED ELDERLY SUBJECTS ACCORDING TO EDUCATIONAL STATUS

Educational status	No.	%
Primary	18	36
High school	30	60
Higher secondary	1	2
Degree	1	2
Total	50	100

As evident from Table II none of the selected elderly were illiterates. But the level of education was much different from one another. Ninety six per cent had primary or high school education and they were able to read newspapers. Two subjects (4%) and only one elderly (2%) had completed higher secondary and degree course respectively. Though there were no illiterates, majority had only school education.

3. Past occupation

The distribution of selected subjects according to the occupation they had been doing before retirement is presented in Table III

TABLE III

DISTRIBUTION OF SELECTED SUBJECTS ACCORDING TO THE PAST OCCUPATION

Past occupation	No.	%
Business	4	7
Driver	2	5
Government job	2	5
Housewives	32	56
Housewife + tailor	7	13
Tailor	8	14

As there were more women it was found out that 57 per cent of them were housewives. Some women along with looking after the household did part time tailoring work. Out of the 16 men some did business, tailoring and two were in government jobs.

4. Source of Income

Table IV shows the distribution of subjects according to their income source.

TABLE IV

DISTRIBUTION OF SUBJECTS

ACCORDING TO THEIR INCOME SOURCE

Source of income	No.	%
Pension	18	36
Children	18	36
Interest from bank	14	28
Total	50	100

It is obvious from Table IV that 18 members received pension. Out of this eighteen, two elderly men who held government jobs received their pension. Rest were females who got family pension as their husbands were in pensionable jobs. Eighteen subjects got money from their children and the rest had deposited money in the bank and got interest from the bank.

For most of the elderly the income they received was adequate only to meet their monthly expenditure in the institutions and all of them complained that the amount received was inadequate.

B. Dietary practices in the selected institutions

The three selected institutions were surveyed to find out the basis for menu planning, type of menu, method of cooking and type of foods provided. The results are presented in the following tables.

1. Menu planning

The factors considered by the institutions in planning menu are presented in Table V.

TABLE V

FACTORS CONSIDERED WHILE PLANNING MENU

Factors	No.	%
Nutritional basis	3	43
Seasonal basis	3	43
According to likes and dislikes	1	14

As depicted in Table V all the three selected institutions indicated that menu was planned to meet the nutrient requirement of the inmates and according to the seasonal availability of foods. Only one institution indicated that the likes and dislikes of the inmates were considered. Bulk purchasing was done in all the three homes.

2. Type of menu

All the three institutions said that cyclic menu was followed in their institutions. This helped them in planning and purchasing of ingredients. They indicated that this type of menu also helped to save time in planning and organizing.

3. Method of cooking

Table VI shows the method of cooking followed in the selected institutions.

TABLE VI

METHOD OF COOKING FOLLOWED IN THE SELECTED INSTITUTIONS

Food groups	Boiling		steaming		Pressure cooking		Roasting		Deep fat frying		Braising	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cereals												
Raw Rice	1	36	-	-	2	64	-	-	-	-	-	-
Parboiled rice	-	-	-	-	3	100	-	-	-	-	-	
Ragi	-	-	3	100	-	-	-	-	-	-	-	-
Wheat	-	-	-	-	-	-	-	-	-	-	3	100
Rava	-	-	-	-	-	-	3	100	-	-	-	-
Pulses												
Bengal gram dhal	2	64	-	-	1	36	-	-	-	-	-	-
Black gram dhal	2	64	-	-	1	36	-	-	-	-	-	-
Green gram	3	100	-	-	-	-	-	-	-	-	-	-
Red gram dhal	3	100	-	-	-	-	-	-	-	-	-	-
Soya	-	-	-	-	3	100	-	-	-	-	-	-
GLV	3	100	-	-	-	-	-	-	-	-	-	-
Roots and tubers												
Onion	-	-	-	-	-	-	3	100	-	-	-	-
Potato	-	-	-	-	3	100	-	-	-	-	-	-
Beetroot	1	36	-	-	2	64	-	-	-	-	-	-
Carrot	3	100	-	-	-	-	-	-	-	-	-	-
Yam	3	100	-	-	-	-	-	-	-	-	-	-
Other vegetables												
Brinjal	3	100	-	-	-	-	-	-	-	-	-	-
Khol-khol	-	-	-	-	3	100	-	-	-	-	-	-
Cucumber	3	100	-	-	-	-	-	-	-	-	-	-
Drumstick	3	100	-	-	-	-	-	-	-	-	-	-
Ridge gourd	3	100	-	-	-	-	-	-	-	-	-	-
Fleshy foods												
Fish	2	100	-	-	-	-	-	-	-	-	-	-
Egg	2	100	-	-	-	-	-	-	-	-	-	-
Chicken	2	100	-	-	-	-	-	-	-	-	-	-

As the elderly preferred soft diet, rice and vegetables were cooked using pressure cooking. Boiling was the common method employed for cooking dhals, vegetables and fleshy foods. Frying was restricted in the case of vegetables and fleshy foods. As frying foods absorbs more oil and at the same time makes food hard and crispy, elderly people did not prefer fried foods. Hence in general deep frying was avoided.

4. Non-vegetarian foods served in the selected institutions

Out of the three selected institutions non-vegetarian foods were served only in two institutions. In these institutions fleshy foods were provided only once a month, as the cost of the fleshy foods is very high. One institution did not provide non-vegetarian foods. All the inmates were also vegetarians.

C. Dietary pattern of the elderly

1. Type of food consumed

The distribution of selected subjects according to the type of food consumed is shown in Table VII.

TABLE VII

DISTRIBUTION OF SELECTED SUBJECTS

ACCORDING TO THE TYPE OF FOOD CONSUMED

TYPE OF FOOD	No.	%
Vegetarian	31	62
Non-vegetarian	19	38
Total	50	100

Table VIII presents that there were more vegetarians compared to non-vegetarians. Out of the three institutions selected, non-vegetarian foods were available only in two homes, as indicated already. But it was evident that the

elderly subjects preferred vegetarian food compared to non-vegetarian foods. Those who were non-vegetarians at their younger age also did not like to consume non-vegetarian foods. They reported that non-vegetarian food consumption produced digestive problems and hence they restrained from consuming them.

2. Meal pattern

Enquiry into the meal pattern indicated that all the three selected institutions provided three meals per day and tea in the evening. Only one institution provided some snack in the evening. The snack provided was sundal. The administrators of the institution said that they would not leave anybody go without meals or skip meals. But the quantity of food consumed was very much limited in the case of subjects above 75 years.

3. Food acceptability

The likes and dislikes of the elderly to the foods served in the institution are depicted in Table VIII.

TABLE VIII

REASONS FOR LIKES AND DISLIKES OF THE ELDERLY TO THE FOODS SERVED

Food acceptability	No.	%
Satisfactory	40	80
Soft	10	20
Easy to chew	21	42
Tasty	9	18
Not satisfactory	10	20
Semi solid	6	12
Chill	2	4
Spicy	2	4
Total	50	100

Data presented in Table VIII shows that 80 per cent of the elderly liked the foods served in the institutions. They said that the foods served were soft, easy to chew and tasty. They did not have any dissatisfaction towards food.

These subjects willingly participated in pre-preparation of foods such as cleaning and cutting vegetables.

Only 10 subjects (20%) did not like the food served in the institutions. They complained that food was semi solid in consistency/over cooked and was very spicy.

Eighteen subjects had dental problems like loose fitted dentures and were not able to chew the food. Those who had no dental problem did not like soft cooked rice.

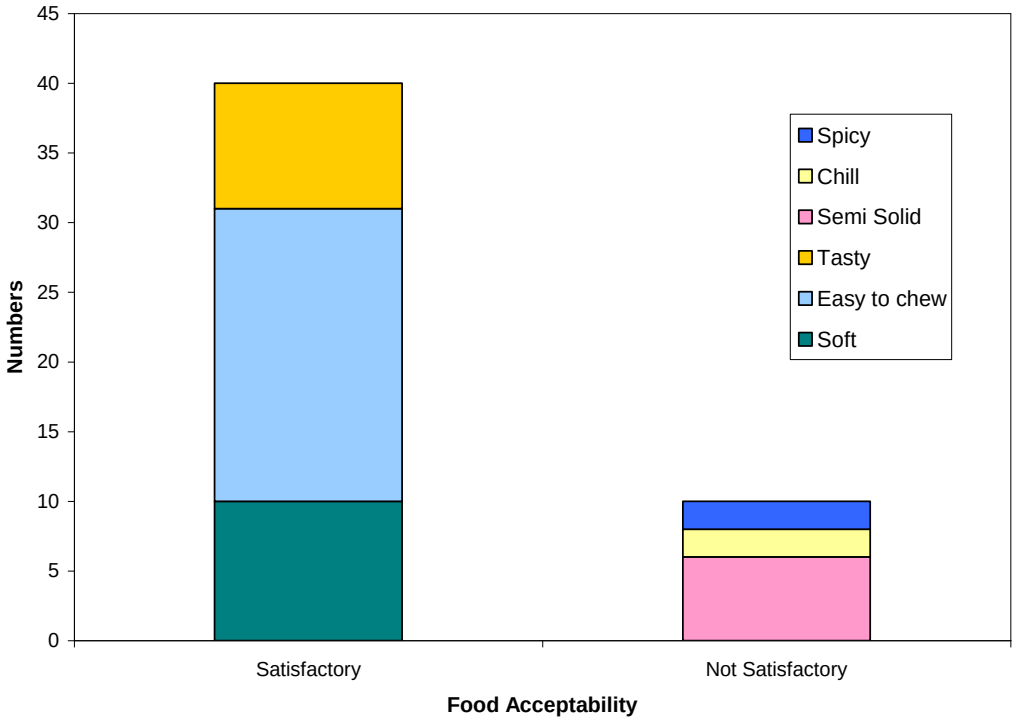

FIGURE - 1
LIKES AND DISLIKES OF ELDERLY TO THE FOODS SERVED

4. Food consumption pattern

The food consumption pattern was collected from the menu planning by the institution and also by enquiring the selected subjects. The results are depicted in Table IX.

TABLE IX

FREQUENCY OF CONSUMPTION OF DIFFERENT FOODS

Food groups	Daily		Weekly twice		Weekly once		Monthly twice		Monthly once		Occasio nally		Never	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cereals														
Raw Rice	50	100	-	-	-	-	-	-	-	-	-	-	-	-
Parboiled rice	40	80	-	-	10	20	-	-	-	-	-	-	-	-
Ragi	10	20	-	-	-	-	22	44	-	-	18	36	-	-
Wheat	10	20	-	-	22	44	18	36	-	-	-	-	-	-
Rava	-	-	-	-	50	100	-	-	-	-	-	-	-	-
Pulses														
Red gram dhal	50	100	-	-	-	-	-	-	-	-	-	-	-	-
Black gram dhal	40	80	10	20	-	-	-	-	-	-	-	-	-	-
Green gram	10	20	-	-	40	80	-	-	-	-	-	-	-	-
Bengal gram	-	-	50	100	-	-	-	-	-	-	-	-	-	-
Soya	-	-	-	-	-	-	10	20	-	-	40	80	-	-
GLV	-	-	40	80	10	20	-	-	-	-	-	-	-	-
Roots and tubers														
Onion	50	100	-	-	-	-	-	-	-	-	-	-	-	-
Potato	-	-	-	-	-	-	-	-	-	-	40	80	10	20
Beetroot	-	-	-	-	32	64	18	36	-	-	-	-	-	-
Carrot	-	-	32	64	18	36	-	-	-	-	-	-	-	-
Yam	-	-	-	-	-	-	10	20	22	44	18	36	-	-
Other vegetables														
Brinjal	-	-	50	100	-	-	-	-	-	-	-	-	-	-
Kholl-khol	-	-	-	10	20	40	80	-	-	-	-	-	-	-
Cucumber	-	-	-	-	-	28	56	22	44	-	-	-	-	-
Drumstick	-	-	50	100	-	-	-	-	-	-	-	-	-	-
Ridge gourd	-	-	50	100	-	-	-	-	-	-	-	-	-	-
Fruits	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fleshy foods														
Fish	-	-	-	-	6	12	-	-	-	-	7	14	37	74
Egg	-	-	-	-	7	14	-	-	-	-	12	24	30	60
Meat	-	-	-	-	6	12	-	-	-	-	1	2	43	86
Chicken	-	-	-	-	7	14	-	-	-	-	9	18	34	68

Fats and oils														
Refined sunflower oil	50	100	-	-	-	-	-	-	-	-	-	-	-	-
Butter	-	-	-	-	-	-	-	-	-	-	22	44	28	56
Ghee	-	-	-	-	-	-	-	-	-	-	22	44	28	56
Vanaspathi	-	-	-	-	-	-	-	-	-	-	-	-	50	100
Sugar	48	96	-	-	-	-	-	-	-	-	-	-	2	4
Milk and Milk products	50	100	-	-	-	-	-	-	-	-	-	-	-	-

5. Cereal consumption

Cereal consumption pattern point out that rice was the cereal consumed daily. All the homes prepared rice based items for breakfast and lunch. This included preparations such as rice, idly, dosai, puttu and idiyappam. It was observed that raw rice was used in the preparation of rice for lunch. Wheat was consumed once or twice in a week. Wheat was used only for the preparation of chapathis for dinner.

In one of the selected institutions mixed cereal powder was prepared and porridge using this powder was prepared daily for breakfast. So ten subjects living in this institution consumed mixed cereal pulse porridge daily. The ingredients included in the mix were rice, ragi, wheat, kambu and maize along with pulses like green gram, Bengal gram and roasted Bengal gram dhal. Wheat rava was used once a week.

Cereal contributes more than 70 per cent of the protein to the diet. They contain 6 to 14 per cent of protein depending on the cereal (Pradeep Kumar and Jamuna Prakash, 2006).

b. Pulse consumption

With regard to pulse consumption, it is evident from Table IX that red gram dhal and Bengal gram dhal were consumed daily. Green gram dhal was consumed once a week and soya was included occasionally. But those elderly subjects living in Neyam home consumed green gram daily as part of the

mixed cereal and pulse porridge. Black gram dhal was consumed daily as part of idli/dosai.

c. Green leafy vegetable consumption

Green leafy vegetable consumption indicated that 40 elderly (80%) consumed greens weekly twice and in one home this was prepared only once a week. All the selected subjects said that they consumed green leafy vegetable preparation as it was given in the form of masiyal. Hence the consumption of green leafy vegetable was inadequate.

d. Fruits and Vegetable consumption

Consumption pattern of other vegetables revealed that required quantity of vegetables were provided daily and the subjects also consumed them daily. The vegetables were selected according to the seasonal availability. Fruits were not provided in the selected institutions.

Khaja (2005) has indicated that use of fiber allows discontinuation of laxatives in the elderly. On par with this statement the selected elderly indicated that they consumed all the vegetable that were provided to them.

e. Roots and tuber consumption

Among roots and tubers onion was used daily and carrot was used twice in a week. Other roots and tubers were used twice in a month or occasionally. Potato was consumed only occasionally.

f. Fleshy food consumption

As indicated in Table V only 19 subjects (38%) were non-vegetarians. Seven non-vegetarian subjects preferred fish, chicken and mutton once in a week. Other subjects indicated that they were not very particular about consumption of fleshy foods and indicated that they consumed them only occasionally.

In the institutions where non-vegetarian foods were prepared, only after finding out the number of subjects ordering for non-vegetarian foods it was prepared once in a month only.

g. Fats and oil consumption

In all the institutions refined sunflower oil was the only oil used in the preparation of foods. So, all the subjects consumed sunflower oil daily. Butter, ghee and vanaspathi were consumed occasionally in one institution and not at all used in two other institutions.

h. Sugar consumption

Sugar was consumed daily by 48 subjects though there were 4 diabetics. Out of the 50 elderly selected only 2 diabetes restricted sugar and sweets. All the others consumed sugar daily.

i. Milk and milk product consumption

Milk and milk products were provided in adequate amounts in all the three selected institutions. It was also found out that all the selected subjects consumed milk and milk products regularly.

D. Anthropometric Measurements of the elderly

The anthropometric measurements namely height and weight were recorded for the selected elderly and Quelet index namely BMI was calculated. The individual height, weight and BMI are presented in Appendix IV.

I. Body mass index

The distribution of elderly according to BMI classification is presented in Table X.

The BMI classification is shown in Figure 2.

TABLE X

DISTRIBUTION OF ELDERLY

ACCORDING TO BODY MASS INDEX

BMI	Criteria	Male	Female	Total	%
< 18	CED	3	3	6	12
19 – 24.9	Normal	8	22	30	60
25 – 29.9	Overweight	5	5	10	20
> 30	Obese		4	4	8
Total		16	34	50	100

Garrow (1993) has classified the BMI values into chronic energy deficiency, normal, overweight and obese. According to this classification the normal BMI for male and female subjects are 20 to 24.9 and 19 to 24 respectively.

As depicted in Table X 8 male subjects and 22 female subjects were classified as having normal BMI. Three male subjects and 3 female subjects had BMI less than 18 and were classified as having chronic energy deficiency. Overweight was present in one male subject and 6 female subjects. Increased body fat was prevalent more among females compared to male subjects.

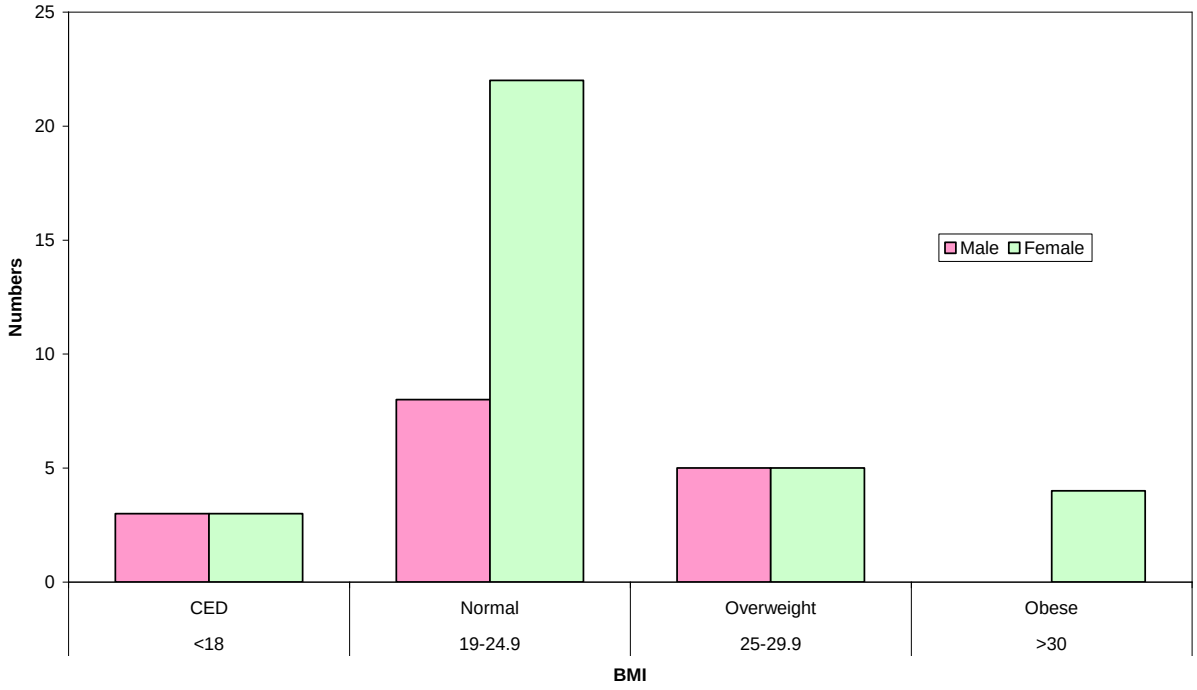

FIGURE - 2
BMI OF MALE AND FEMALE SUBJECTS

S

2. Mean Body Mass Index

Table XI presents the mean BMI of male and female subjects.

TABLE XI

MEAN BODY MASS INDEX OF

MALE AND FEMALE SUBJECTS

Group	N	BMI Mean ± S.D
Male	16	22 ± 3.92
female	34	23 ± 4.,09

The mean body mass index for male and female subjects in the present study is 22 and 23 respectively. These values are within the normal suggested by Garrow. Male subjects had less body weight compared to female subjects. As pointed out in Table X 4 female subjects were obese, while none of the male subjects were obese. The quantity of food and fats consumed by the female subjects was comparatively more than that of the male subjects. Physical inactivity was the main contributory factor for obesity in female subjects.

E. Clinical examination of the elderly

All the fifty elderly selected were clinically examined and the results are presented in Table XII.

TABLE XII

DISTRIBNUTION OF SUBJECTS

ACCORDING TO CLINICAL SYMPTOMS

Clinical symptoms	No	%
General		
Skinny	2	4
Wasted	2	4
Loss of appetite	12	24
Normal	34	68
Skin		
Dry	1	2
Rashes	1	2
Normal	48	96
Eyes		
Blurring of vision	17	34
Normal	33	66
Teeth		
Dental causes	18	36
Artificial denture	14	28
Normal	18	
Extremities		
Joint pain	24	48
Weakness	10	20
Normal	16	32

Results of clinical examination presented in Table XII indicate that majority of the elderly living in the institutions did not show any symptoms of deficiency. They showed problems which are related to aging. Loss of

appetite, blurring of vision, dental caries were the complaints prevalent among the selected subjects. The major problems were general weakness and joint pain. As bones become osteoporotic and fragile in old age these problems were prevalent. Dental caries was present in 18 subjects and 14 subjects had fixed artificial dentures. Two subjects were very lean with wasted muscles and were skinny.

Morley et al (2001) have also found out that many older persons suffer from anorexia.

Prevalence of non-communicable diseases

Prevalence of non-communicable diseases among the selected elderly are presented in Table XIII. The results are presented in Figure III.

TABLE XIII

DISTRIBUTION OF SUBJECTS

ACCORDING TO PREVALENCE OF DISEASES

Disease	Number
Diabetes mellitus	4
Anaemia	5
Cardiovascular disease	3
Stroke	3
Hypertension	3
Cancer	1
Leg pain	7
Joint pain	24
Asthma	8

As shown in Table XIV 4 subjects suffered from diabetes mellitus and 3 had anaemia. Cardiovascular disease and hypertension were prevalent in three subjects each. The most common symptom among elderly was weak bones due to demineralization of bones. Eight subjects had asthma.

The subjects were under treatment for the respective disorders.

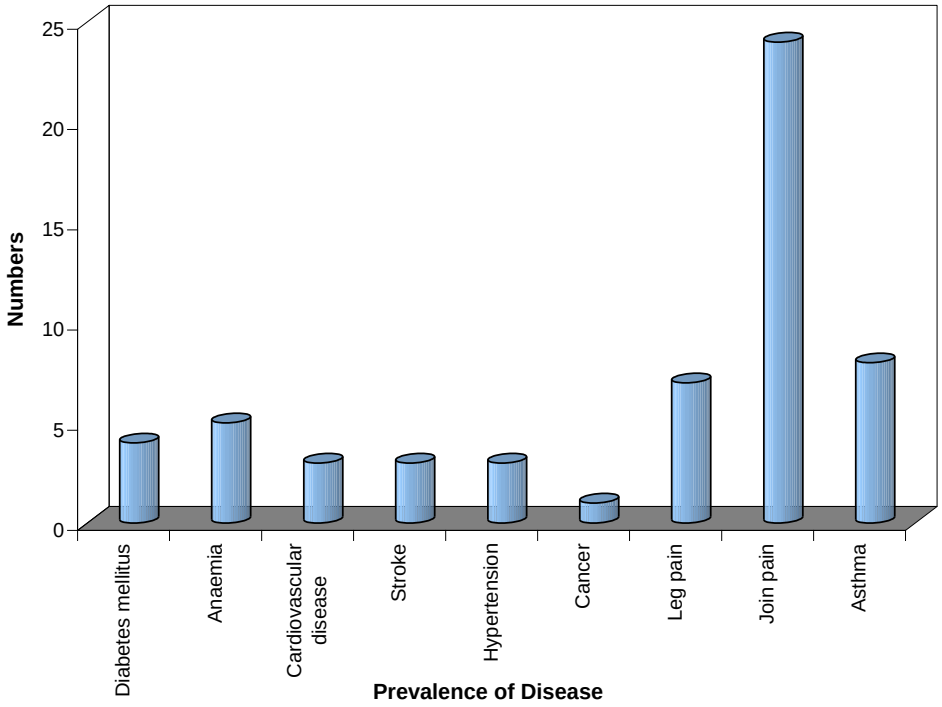

FIGURE - 3
DISTRIBUTION OF SUBJECTS ACCORDING TO PREVALENEC OF DISEASES

F.Biochemical assessment of the elderly

The biochemical analysis namely haemoglobin, fasting blood sugar, lipid profiles and serum proteins was done for all the selected elderly. Table XIV presents the mean biochemical values for male and female subjects. The individual biochemical values are presented in Appendix IV.

TABLE XIV

MEAN BIOCHEMICAL VALUES FOR THE SELECTED SUBJECTS

criteria	standard	male mean±S.D	female mean±S.D
Fasting blood glucose (mg/dl)	80 -100	101.4 ± 67.65	104.2 ± 51.69
Haemoglobin(g/dl)	Males -14-16 Females -12-14	13.3 ± 1.69	11.8 ± 1.52
Total cholesterol(mg/dl)	<200	156.1 ± 25.76	183.1 ± 32.38
Triglyceride (mg/dl)	<150	84.7 ± 15.49	122.9 ± 77.85
LDL(mg/dl)	<100	83.3 ± 26.84	106 ± 31.93
HDL(mg/dl)	>35	56.6 ± 7.42	52.8 ± 10
VLDL(mg/dl)	<40	16.9 ± 3.23	24.6 ± 15.55
Albumin(g/dl)	3.5-5.5	3.9 ± 0.32	3.6 ± 0.32
Globulin(g/dl)	2.0-3.6	3.2 ± 0.44	2.9 ± 0.34

The results of biochemical analysis presented in Table XV indicates that only four female subjects had haemoglobin values less than 10g/dl, while three male subjects had haemoglobin values between 9 to 11g/dl showing an anaemic condition. The individual values given in Appendix-V indicated that three female and one male had fasting blood sugar level in the range of 200 to 350mg/dl. Only three females had triglyceride levels greater than 190mg/dl. Out of the three one reported to have triglyceride in the range of 500mg/dl which reflected a high risk level. The blood cholesterol and serum protein levels were within the normal ranges as indicated by NCEP standards.

The mean biochemical values for male and female subjects in the present study indicate that their haemoglobin levels were in the range of 11.8 and 13.3 respectively. The blood glucose levels in the range of 104.2, 183.1, 122.9, 52.8, 106, 24.6 and 3.6, 2.9 respectively. These values were within the normal range.

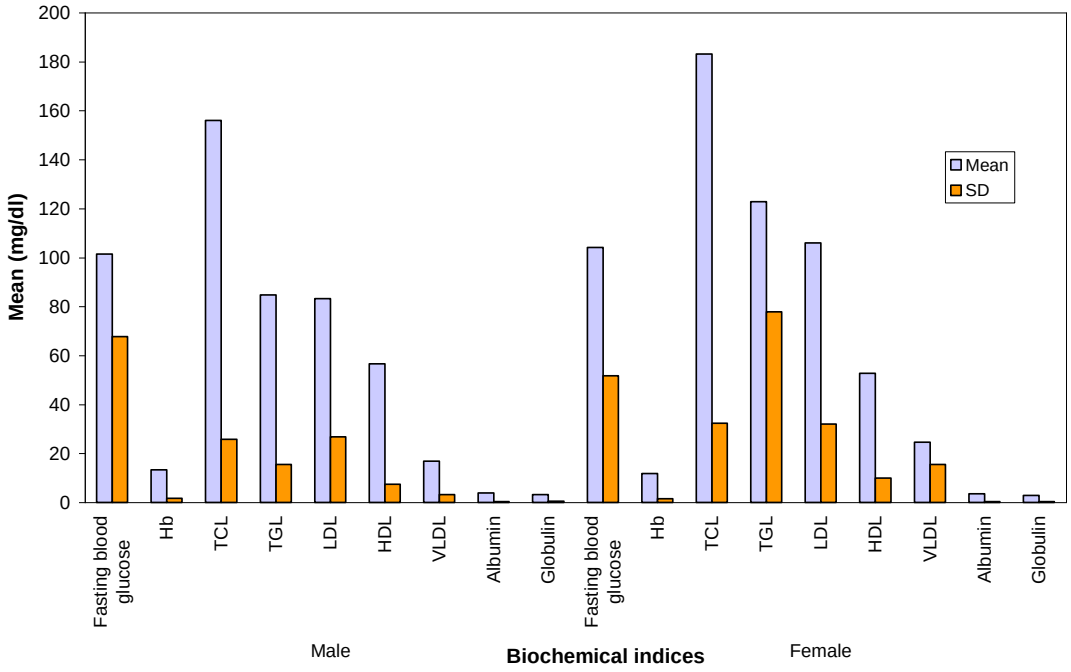

FIGURE - 4
MEAN BIOCHEMICAL INDICES FOR MALE NAD FEMALE SUBJECTS

V. SUMMARY AND CONCLUSION

The present study on "Health status and dietary practices of institutionalized senior citizens" was undertaken to assess the health status of the elderly living in institutions. The study was formulated to assess the food consumption pattern, health status, prevalence of diseases and to evaluate the dietary practices followed in selected institutions.

Three old age homes in Coimbatore city namely Neyam, Missionaries of Charity and Mother Care Centre were selected for conducting the study. All the elderly residing in the three selected institutions were included in the study. A total number of 50 elderly subjects in the age range of 60-90 years were selected. There were 16 elderly men and 34 elderly women in the selected institutions. Two interview schedules were formulated by the investigator. One was developed to elicit the socio economic background dietary practices of the selected elderly. Anthropometric measurements and biochemical investigations to estimate blood glucose, haemoglobin, albumin, globulin and lipid profile were done for all the 50 selected subjects. Another interview schedule was formulated to collect information from the administrators of the institutions. This data included information regarding menu planning, type and pattern of menu, methods of cooking and involvement of the inmates in food preparation. The information was collected through direct personal interview. Clinical examination was conduced to identify the symptoms of nutrient deficiency.

The results revealed the following:

1. There were more female elderly compared to male and majority of the subjects were between 60 and 70 years of age.
2. All the selected senior citizens were literates and majority had completed school education.

3. Thirty six per cent received family pension and another thirty six per cent received money from their children. Rest received interest from bank deposits.
4. Dietary pattern of the elderly revealed that sixty two per cent were vegetarians and rest were non-vegetarian. But even the non-vegetarians preferred to consume vegetarian diet. Non-vegetarian foods were consumed occasionally.
5. Meal pattern consisted of three meals per day with only tea in the evening. Only one institution provided some snack in the evening. The snack provided often was sundal.
6. Majority of the subjects liked the foods served in the institutions. Only ten subjects (20%) expressed dislike for the food.
7. Food consumption pattern pointed out that the subjects had adequate cereal and pulse consumption. Green leafy vegetable consumption was inadequate.
8. Vegetable consumption was found to be inadequate. Seasonal availability was considered in selecting vegetables.
9. Roots and tubers consumption was restricted.
10. Non-vegetarians were given fleshy foods only once a month in two of the selected institutions. Non-vegetarian foods were not served in one institution.
11. Fats and oils consumption, sugar and milk and milk products consumption were adequate in all the three selected institutions. Importance was given to milk and milk products and they provided adequate quantity.

12. Dietary practices followed in the selected institutions indicated that cyclic menu pattern was followed and foods were purchased according to seasonal availability.

13. Nutrient requirement of the elderly and seasonal availability were the points considered by the authorities while planning the menu. Likes and dislikes of the subjects were considered in only one institution.

14. Pressure cooking and boiling methods of cooking were followed to make the food soft and palatable.

15. Majority of the subjects had normal BMI. Six female subjects and one male subject had overweight or obesity.

16. Clinical examination indicated no major symptoms of deficiency. Joint pain and general weakness were the symptoms expressed by the selected subjects. Three females had wasted muscles and showed chronic energy deficiency.

17. Dental problems were present in 14 subjects.

18. Cardiovascular disease, hypertension and cancer were prevalent totally in 5 subjects three, one and one subjects respectively. Four subjects had diabetes mellitus.

19. Biochemical analysis indicated that only female subjects had slightly low haemoglobin level. Four female subjects had haemoglobin values less than 10 while 3 male subjects had haemoglobin values between 9 to 11 g/dl showing anaemic condition. Blood glucose values, serum protein and lipid profile were within normal ranges. In the case of lipid profile 8 female subjects had registered high cholesterol values which reflected high risk level.

20. Physical exercise and low fat intake are recommended for female subjects who were obese and who had high total cholesterol levels.

The results of the present study has brought out the fact that the selected senior citizens living in the oldage homes were found to be generally healthy. Anaemia and calcium deficiency were the nutritional problems prevalent among the selected subjects. Inadequate fruit consumption and lack of vitamin C source in the diet could have been the main cause for these conditions. Fruits were not provided in the selected institutions. It is recommended that oldage homes should provide required quantity of fruits and vegetable salads to the inmates.

BIBLIOGRAPHY

- Abdel Baset, I.M., Hasouneb, (2003), Research Methodology, sublime Publications Jaipur, India, P.35.
- Agudo, Ibanez, Amiano, Ardanaz, Berenguer., (2007), "Consumption of cruciferous vegetables and glucosinolates in a Spanish adult population", European journal of clinical nutrition, Vol.14.
- Amir Aslani., Mahmood Zamirian, Alirezamoaref, (2007), "Significant of aortic atheroma in elderly patients with ischemic stroke", clinical neurology and neurosurgery, Vol.109, Pp.311-316.
- Asplund., (2004), "Nocturia, Nocturnal Polyuria, and Sleep quality in the elderly", journal of Psychosomatic research, Vol.56, Pp.517-525.
- Bamji., (1996), "Text book of human nutrition", published by vijay primdani for oxford and IBM publishing Co. Pvt. Ltd., P.462.
- Beard, (2005), "Prevalence of skin disease among the elderly in different clinical environments, Australian journal on ageing, Vol.24, Pp.71.
- Brown, EL., Bruce, Avay, Rave, Lachs, (2000), "Recognition of late life depression in home care : accuracy of the outcome and assessment information set", Gerontology, Vol.26, Pp.77.
- Carlson, (2006), "Health promotion program involving older adults", Gerodontology, Vol.53.
- Covinsky, Kahana, Chin, Palmer, Fortinsky, (1999), "Development symptoms and 3 year mortality in older hospitalized medical patients", Annual international medicine, Vol.130, Pp.563-569.

- Dahl, Whiting, Healy, Zello, (2004), "Increased stool frequency occurs when finely processed peas hull fiber is added to usual foods consumed by elderly residents in long term care", Journal of American Dietetic Association, Vol.98.

- Daniel Burkhoff, (2006), "Ventricular structure and function in hypertensive participants with heart failure and a normal ejection fraction", Journal of the American college of cardiology, Vol.16.

- David Johnson, A., (2004), "Heart burn severity under estimates erosive esophagitis severity in elderly patients with gastro esophageal reflux disease", Gastro enterology, Vol.126, Pp.660-664.

- Deschamps., (2002), "Effect of BMI on Cognitive function", Gerontology, Vol.4.

- Donald, (2004), "Health and Nutritional status of elderly", Journal of ageing studies, Vol.163, P.1390-1405.

- Donini, Savina, Cannella, (2002),"Eating habits and appetite control in the elderly: the anorexia of ageing", Journal of aging, Vol.12.

- Eddy Barasch, (2006), "Clinical Significance of calcification of the fibrous skeleton of the heart and artheosclerosis in community dwelling elderly", American heart journal, Vol.151, Pp.39-47.

- Edward Castillo, M., (2003), "Sarcopenia in elderly men and women", American journal of preventive medicine, Vol.25, Pp.226-231.

- Evans, Fletcher, Wormald, (2007), "Depression and anxiety in visually impaired older people", ophthalmology, Vol.114, Pp.283-288.

- Flood Car, (2004), “Effect of micronutrient supplementation on elderly”, current opinion in gastroenterology, Vol.110.

- Gaillara, (2006), “A crisis team in the field of old age psychiatry”, Nutrition research, Vol.2, Pp.2088-2091.

- Garrow, J.S., (1993), Human nutrition and dietetics, Harcourt publication, Pp.524-543.

- Gehlbach, (2002), “Vertebral fracture risk and impact of database selection on identifying elderly Lebanese with osteoporosis”, Journal of nutrition, Vol.48.

- Gerber, (2003), “Nutritional status using the mini nutritional assessment questionnaire and its relationship with bone quality in a population of institutionalized elderly women”, Journal nutrition health and aging, Vol.7, Pp.140-145.

- Greenwood, (2001), “Dietary carbohydrates, glucose regulation and cognitive performance in elderly persons”, Journal nutrition, Vol.101.

- Guo-Bingxu, Zhi-yan Li, Jie-Anxia, “Prevalence of chronic kidney disease in a middle and old-aged population of Beijing”, Clinical Chimica Acta, Vol.366, Pp.205-215.

- Gupta, S.P., (2005), Statistical methods, Sultanchand and Sons, Educational publications, New Delhi, P.42.

- Gustafsson, Ekblad, (2005), “Older women and dietary advice: occurrence, comprehension and compliance”, Journal of Human nutrition and dietetics, Vol.18, Pp.421-422.

- Hanamori, Kadoya, Nishimuta, Hiyazaki, Watanabe, (2004), "Nutritional intake community-dwelling older Japanese adults", Journal of nutritional Science, Vol.50, Pp. 184-195.

- Hara, Tanaka, Hirota, (2005), "Role of vitamin E on immune response of the elderly", Journal of nutrition, Vol.21.

- Haub, (2005), "Beef & Soy-based food supplements differentially affect serum lipoprotein – lipid profiles because of changes in carbohydrate intake and novel nutrient intake ratios in older men" metabolism, Vol.54, Pp.769-774.

- Heaney, (1999), "Dietary changes favorably affect bore remodeling in older adult", Journal of American Dietetic Association, Vol.10, Pp.1228-1233.

- Hodgson, Devine, Puddey, (2003), "Tea intake is inversely related to B.P in older women", Journal of nutrition, Vol.97.

- Holmes, (2004), "Influences on fruit, vegetable and grain intake of older men", Journal of nutrition, Vol.32.

- Hopkins, (1993), "Human nutrition", Elsevier (US) Publications, Pp.276-8.

- Huerta, Gonzalez, Vigie, Prada, (2004), "Cobalamin, a critical vitamin in the elderly", Clinical biochemistry, Vol.47.

- Husted, Damsgaard, Brynningsen, (2007), "Improved nutritional status in elderly patients 6 months after stroke", Journal of nutrition and health ageing, Vol.11, Pp.75-79.

- Iliffe, (2005), “Self-reported visual function in healthy older people in Britain : an exploratory study of association with age, sex, depression, education and income”, Family practices, Vol.22, Pp.585-590.

- Irving, Ibanez, Amiana, Ardanaz, Berenguer, (1999), “Nutritional and Cognitive status in elderly subjects living in service flats and the effect of nutrition education on personnel”, Gerontology, Vol.45, Pp.187-194.

- Justinio, (2001), Changes in the retinocortical evoked potentials in subjects 75 years of age and older”, Clinical Neurophysiology, Vol.112, Pp.1343-1348.

- Kaklamani, (2000), “Dietary factors in relation to rheumatoid arthritis : a role for olive oil and cooked vegetables”, American journal of clinical nutrition, Vol.71, Pp.1010.

- Kaluza, Dolowa, Roszkowski, Brzozowska, (2005), “Survival and habitual nutrient intake among elderly men”, Journal of nutrition, Vol.56, Pp.361-370.

- Kant, (2002), “Human nutrition and dietetics”, Elsevier (US) Publications.

- Katherine Gooch., (2007) “NSAID use and Progression of chronic Kidney disease”, The American Journal of Medicine, Vol.120, Pp. 280.

- Khaja, Thakur, Bharathan, (2005), “Fibre act as natural laxatives”, Gerodontology, Vol.58.

- Kothari, C.R., (2004), “Research Methodology and techniques, New age international (P) Limited, Publishers.

- Krishnamurthy., (2007), “Effect of yoga on geriatric depression”, Journal of gerontology, Vol.33

- Kumar, P., and Prakash, J., (2006), “Effect of Spices on in-vitro protein digestability of Cereals, Pulse mixtures”, The Indian Journals of nutrition and dietetics.

- Ledikwe, (2006), “Nutrient intake & dietary quality in the very old”, Gerodontology, Vol.24.

- Liedberg, (2007), “Inadequate dietary habits and mastication in elderly men”, Gerodontology, Vol.24, Pp.41-46.

- Lorefalt, (2004), “Factors of importance for weight loss in elderly patients with Parkinson’s disease”, Acta Neurologica Scandinavia, Vol.110, Pp.180.

- Maeng Je cho, (2003), “Community study of dementia in the older Korean rural population”, Australian and New Zealand journal of psychiatry, Vol.37, Pp.606.

- Mitchell, Haan, Steinberg, (2003), “Body composition in the elderly : the influence of nutritional factors and physical activity”, Journal of nutrition, health and ageing,Vol.32.

- Mitsuko Takahashi, Atsushi Araki and Hideki Ito, (2002), “Development of a new method for simple dietary education in elderly patients with diabetes mellitus”, Japanese journal of Geriatrics, Vol.39, Pp.527-532.

- Morley, Astier, Ferry, Rain Fray, Emeriau, (2001), “Decreased food intake with aging”, Journal of gerontology, Vol.56, Pp.81-88.

- Murphy, (2000), “The use of the mini-nutritional assessment tool in elderly orthopedic patients”, European Journal of clinical nutrition, Vol.54, Pp.555-562.

- Nadine Sahyoun, R., (2002), “Nutrition education for the healthy elderly population : Isn’t it time?”, Journal of nutrition education and behaviour, Vol.34, Pp.S42-S47.

- Nakamura, (2006), “A longitudinal study on the nutritional state of elderly women at a nursing home in Japan, International Medicine, Vol.45, Pp. 1113-1120.

- Nelson, (2003), “Dietary modification and moderate antioxidant supplementation differently affect serum cartenoids, antioxidant levels and markers of oxidative stress in older humans”, Journal of nutrition, Vol.21.

- Nelson, (2006), “Food safety guidance for older adults” clinical infectious diseases, Vol.42, P.1298-1304.

- Nyaruhucha, (2004), “Nutritional status, functional ability and food habits of institutionalized and non-institutionalized elderly people in Morogoro region, Tanzania”, East African Medical Journal, Vol.81, Pp.248-253.

- Ortega, Redondo, Gonzalez, (1996), “Associations between obesity, breakfast time food habits and intake of energy and nutrients in a group of elderly Madrid residents”, Vol.15, Pp.65-72.

- Otiniano, (2003), “Self reported heart attach in Mexican-American elders, examination of incidence, prevalence, and 7 year mortality”, Journal of American Geriatric Society, Vol.51, Pp.923-929.

- Peace, (2001), “The Food Consumption Patterns and Perceptions of Dietary Advice of Older People”, Vol.13, P.173.

- Pei-Yu Lin, (2003), “Prevalence of dry eye among an elderly Chinese population in Taiwan”, Japanese Journal of Nutrition, Vol.110, Pp.1096-1110.

- Promislow, Goodman-Gruen, Slymen, (2002), “Protein consumption and bone mineral density in the elderly”, American journal of epidemiological, Vol.22.

- Raji, Alsnih, Markides, Otlenbacher, (2005), “Weight change and lower body disability in older Mexican Americans”, Vol.53, Pp.1730-737.

- Ram Singh, B., Saraswati Ghosh, Mohammad, Reema Singh, (1995), “Dietary intake, plasma levels of antioxidant vitamins and oxidative stress in relation to coronary artery disease in elderly subjects”, The American journal of Cardiology, Vol.76, Pp.1233-1238.

- Ramos, Allen, Haan, (2004), “The effect of folic acid on depressive elderly in Latina Women”, American journal of clinical nutrition, Vol.45.

- Ray, Malkides, Du, Otten bacher, (2003), “Incidence of heart attack in Mexican American elders”, Journal American geriatric society, Vol.57, Pp.939.

- Redondo, M.R., Ortega, Lopez-sobalel, Quintas, (1996), “Difference in breakfast habits between institutionalized and independent elderly Spanish people”, International journal of vitamin and Nutrition research, Vol.66, Pp.363-370.

- Rodney, (1993), “Modern experimental biochemistry”, The Benjamin/cumming publishing Co. Inc., P.408.
- Ronni Chernoff, (2001), “Nutrition and Health promotion in older adults”, Journals of Gerontology, Vol.56, P.47-53.
- Sato, Kaji, Tsuru, Satoh, (2002), “Vitamin K deficiency and Osteopenia in vitamin D deficient in elderly women with parkinson’s disease”, Archives of physical medicine and rehabilitation, Vol.108.
- Sengupta, (2004), Health Issues.
- Sevgi, (2000), “prevalence of diseases among elderly in developing countries”, Turkish Journal of ageing, Vol.38.
- Shabayek, (2000), “nutritional status of Institutionalized and free-living elderly in Alexandria”, Journal of Egyptian public health association, Vol.75, Pp.437-459.
- Shahar, Chai, Chernoff, Dolowa, (2003), “Dietary intake and eating patterns of elderly people in Israel who is at nutritional risk, “European journal of clinical nutrition, Vol.57, Pp. 8-25.
- Shinji seto, Midori soda, Eiji Nakashima, Masazumi Akahoshi., (2007), “Longitudinal analysis of blood pressure trends and prognosis in isolated systolic hypertension in elderly individuals”, American journal of hypertension, Vol.20, Pp. 134-139.
- Somes, Kritchevsky, Shorr, Pahor, (2002), “BMI, weight change and death in older adults : the systolic hypertension in the elderly program 11, American journal of epidemoiology, Vol.32.

- Stefano Muzzarelli., (2006), “Anaemia as independent predictor of major events in elderly patients with chronic angina”, American heart journal, Vol.152, Pp.991-996.

- Sumathi, (2004), “Nutritional status of institutionalized elderly in an old age home in Mysore City”, Nutrition Research, Vol, 19, P.1459-1469.

- Taylor, (2006), “Provision of small, frequent meals does not improve energy intake of elderly residents with dysphagia who live in an extended care facility”, Journal of American Dietetic Association, Vol.106, P.1115-1118.

- Thomas Clausen, Jefferson, Demicheli, Rivetti, (2005), “Predictors of food variety and dietary diversity among older persons in Botswana”, Nutrition Research, Vol.21, Pp.86-95.

- Utama-Ang, Chompreeda, Changchat, (2003), “Study of the association between consumption behaviour factor and hyper cholesterolaemia and related diseases by discriminate analysis techniques”, Journal of nutrition and dietetic, Vol.22.

- Varley, (1996), “Practicals of biochemistry, Satish Kumar Jain for CBS Publisher and Distributors, Pp.661-669.

- Venkat Rao., (1999), “Prevalence of diseases among the elderly” Nutrition research, Vol.19.

- Vikram Patel, (2001), “Aging and Mental Health in a Developing Country : Who cares? Qualitative studies from Goa, India, Vol.32, Pp.29-38.

- Wells, Fray, Rietti, Taylor, Johnson., (2003),"Comparison of vegetarian and beef-containing diets on hematological indexes and iron stores during a period of resistive training in older men", Journal of nutrition", Vol.103, Pp. 601.

- Wha young Kim, HiraHur, Mi Sook Cho, (2003), "Effect of olfactory function on nutritional status of Korean elderly women", Nutrition research, Vol.23, Pp.723-734.

- Yaxing wang, (2006), "Prevalence and causes of visual field loss as determined by frequency doubling perimetry in urban and rural adult Chinese", American journal of ophthalmology,vol.141,Pp.1078.

- Ziol Kowka, (2006), "Oral health status and dental service needs of diabetic patients", Annual academy of medical stetinesis, Vol.52, Pp.103-114.

APPENDIX I

HEALTH STATUS AND DIETARY PRACTICES OF INSTITUTIONALISED SENIOR CITIZENS

INTERVIEW SCHEDULE – FOR SENIOR CITIZENS

1. Name of the interviewer :
2. Name of the interviewee :
3. Age :
4. Sex :
5. Educational level :
6. Past occupation :
7. Income : Pension ☐ Children ☐
   Interest from bank ☐

8. FAMILY BACKGROUND

S. No.	Name	Relation ship with subject	Sex M/F	Edu cation	Occu-pation	Income

9. ANTHROPOMETRIC MEASUREMENT

HEIGHT : CMS
WEIGHT : KGS
BMI : $\frac{\text{Weight in kg}}{\text{Height in m}^2}$

10. Biochemical Assessment

Blood Profile	Test Value
Haemoglobin	
Blood Glucose level (Fasting)	
Lipid : Total cholesterol Triglyceride LDL HDL VLDL	
Protein Albumin Globulin	

11. Dietary Assessment

Food habit : Vegetarian ☐ Non-vegetarian ☐

Meal pattern : One meal a day ☐ Two meals a day ☐

Three meals a day ☐

24 hours dietary recall method

S. No.	Meal	Menu	1st day	2nd day	3rd day	Ingredients	Amount
1	Early morning						
2	Breakfast						
3	Mid morning						
4	Lunch						
5	Mid evening						
6	Dinner						
7	Bed time						

12. Is the food :

Satisfactory	☐	Soft	☐
Easy to chew	☐	Non satisfactory	☐
Solid	☐	Chill	☐
Hard or crisp	☐	Spicy	☐
Semi solid	☐		

13. Food frequency:

S.No.	Food Items	Amount per day	Frequency			Occasionally	Do not consume
			Daily	Weekly	Twice a day		
1	**Cereals**						
	Raw Rice						
	Parboiled rice						
	Ragi						
	Wheat						
	Rava						
2	**Pulses**						
	Bengal gram dhal						
	Black gram dhal						
	Green gram						
	Red gram dhal						
	Soya						
	GLV						
3	**Roots and tubers**						
	Onion						
	Potato						
	Beetroot						
	Carrot						
	Yam						

4	**Other vegetables**						
	Brinjal						
	Kholl-khol						
	Cucumber						
	Drumstick						
	Plantain stem						
	Ridge gourd						
	Fruits						
5	**Fleshy foods**						
	Firsh						
	Egg						
	Meat						
	Egg						
	Meat						
	Chicken						
6	**Fats and oils**						
	Refined Sunflower oil						
	Butter						
	Ghee						
	Vanaspathi						
	Sugar						
7	**Milk and Milk products**						

14. Prevalence of Diseases

Disease	Age of onset	Treatment
Anaemia		
Diabetes mellitus		
Cardiovascular disease		
Hypertension		
Kidney disease		
Leg pain		
Joint pain		
Cancer		
Others		

Type of Medication

☐ Allopathy
☐ Ayurvedic
☐ Homeopathy
☐ Sidha

APPENDIX II

HEALTH STATUS AND DIETARY PRACTICES OF INSTITUTIONALISED SENIOR CITIZENS

INTERVIEW SCHEDULE – FOR ADMINISTRATORS

1. Name of the Institution :
2. Authorised person :
3. When it was started :
4. Location :
5. Whether menu planning is done ahead? Yes ☐ No ☐

   If yes, what is the basis for the menu planning?

   ☐ Nutritional basis
   ☐ Seasonal basis
   ☐ According to Likes and Dislikes

   If others, specify

_____

_____

_____

6. What type of menu is being followed?

   ☐ Cyclic menu
   ☐ Set menu

   If others, specify

_____

7. Specify the menu pattern followed:

1	Early morning						
2	Breakfast						
3	Mid morning						
4	Lunch						
5	Tea time						
6	Dinner						
7	Bed time						

8. METHOD OF COOKING

Food item	Boiling	Steaming	Pressure cooking	Roasting	Deep frying	Braising
Cereals						
Raw Rice						
Parboiled rice						
Ragi						
Wheat						
Rava						

Pulses						
Bengal gram dhal						
Black gram dhal						
Green gram						
Red gram dhal						
Soya						
GLV						
Roots and tubers						
Onion						
Potato						
Beetroot						
Carrot						
Yam						
Other vegetables						
Brinjal						
Kholl-khol						
Cucumber						
Drumstick						
Plantain stem						
Ridge gourd						
Fleshy foods						
Firsh						
Egg						
Meat						
Egg						
Meat						
Chicken						

9. A. Do you provide non-vegetarian foods?
☐ Yes ☐ No

B. If yes how often do you provide non-vegetarian foods?
☐ Yes ☐ No

C. Quantity served?
☐ Fixed ☐ As they like

D. If fixed, specify the amount?
☐ <100g ☐ 100-200g ☐ >200g

APPENDIX - III

CLINICAL ASSESSMENT

Part of the body	Clinical symptoms	Result
General	Wasted Skinny Loss of appetite	
Skin	Thickening Dryness of skin Pigmentation changes Rashes	
Hair	Sparse and thin Easy pluckability Dyspigmentation	
Eyes	Night blindness Bitot's spot Blurring	
Mouth	Glossitis Bleeding gums Angular stomatitis	
Teeth	Mottled enamel Dental carries	
Gums	Spongy and swollen Gums Bleeding gums	
Tongue	Pale tongue Magenta red	
Extremities	Oedema Joint pain Muscle wasting Weakness	
Nails	Paleness Spoon shaped	

APPENDIX IV

BODY MASS INDEX FOR MALE AND FEMALE SUBJECTS

Male			
	Height	Weight	BMI
1	165	53	19.4
2	159	41	16.2
3	163	54	20.3
4	156	40	16.4
5	156	50	21
6	158	70	28
7	150	45	20
8	158	45	18
9	148	65	29
10	156	48	20
11	148	50	23
12	158	68	27
13	153	48	21
14	155	50	21
15	154	60	25
16	150	60	27
Mean	**155.438**	**52.938**	**22.019**
S.D	**4.743**	**8.927**	**3.926**

APPENDIX IV

BODY MASS INDEX FOR MALE AND FEMALE SUBJECTS

Female			
	Height	**Weight**	**BMI**
1	148	47	21.4
2	139	32	16.5
3	144	42	20.2
4	150	48	21.3
5	143	45	22
6	140	42	21.4
7	160	55	21.4
8	144	47	23
9	154	65	27
10	150	60	27
11	153	58	25
12	146	70	32
13	145	50	24
14	150	45	20
15	145	48	23
16	153	45	19
17	155	65	27
18	148	32	14.3
19	144	54	26
20	144	34	16.4
21	152	48	21
22	150	52	23.1
23	153	53	21
24	150	48	24
25	153	74	21
26	156	60	30
27	140	44	30
28	153	50	20
29	154	72	24
30	146	57	32.8
31	156	56	23.4
32	140	48	23.2
33	153	53	21
34	154	46	22.3
Mean	**148.971**	**51.324**	**23.079**
SD	**5.344**	**10.087**	**4.096**

APPENDIX V

BIOCHEMICAL VALUES FOR MALE AND FEMALE SUBJECTS

FEMALE									
	Hb	**Fasting BG**	**TGL**	**TCL**	**HDL**	**LDL**	**VLDL**	**ALBUMIN**	**GLOBULIN**
1	12.2	71.3	106.3	139.4	39.2	78.9	21.3	4.1	2.4
2	7.9	102.4	71.4	149	46.8	87.9	14.3	3.2	3.1
3	11.6	101.9	83.4	183.9	61.2	106	16.7	3.7	3.4
4	13.5	88.2	91.5	173.8	64.4	91.1	18.3	4	3.2
5	13.6	98.7	121.5	236	44.4	167.3	24.3	3.9	3.2
6	12.6	87	92.2	180.9	59.6	102.9	18.4	4.1	3.2
7	11.9	94.2	97.2	152.5	62.6	70.5	19.4	3.9	3.3
8	11.3	70.1	88.3	195.7	57	120	17.7	3.9	3
9	11.6	93.7	87.5	235.7	70.4	147.7	17.6	3.7	3
10	14.5	104.4	75.3	125.1	65	46	15.1	3.8	3.1
11	11.6	99.6	102.2	122.5	52.4	49.4	20.4	3.9	3
12	13.8	121.8	73.7	161.7	59.8	87.2	14.7	3.9	3
13	12.1	86	101.3	205.9	57.8	127.9	20.2	3.8	3
14	11.7	81.4	86.9	179.3	45	116.9	17.4	3.6	3.4
15	12.7	293	108	190	62	106.7	21.6	3.6	3.4
16	8.7	101.1	78.9	134.8	61.4	57.6	15.8	3.5	3.3
17	14.6	92.8	88.9	187.3	65.4	104.2	17.7	4.4	2.8

18	13.2	57.4	156.2	131.5	46.2	54.1	31.2	2.7	2.5
19	9.5	67.3	56.7	161.7	56.4	94	11.3	3.2	3
20	12.2	74.9	198.8	189.5	54.6	95.1	39.5	4.1	2.5
21	12.6	76.5	145.1	194.7	41.8	123.2	29	3.7	2.5
22	11.8	85.4	141.2	218,2	50	140	28.2	3.7	2.7
23	10.6	92.1	109.7	210.4	37	151.5	21.9	3.3	2.9
24	11.6	98.7	162.9	202.2	39.4	130.2	32.6	3.4	3.2
25	12.2	84.2	161	219.2	35	151.9	32.2	3.8	2.8
26	10.9	234.7	521.1	227.6	37.2	96.2	104.2	3.6	2.6
27	12.6	103.6	147.2	167.1	56.4	81.3	29.4	3.7	2.9
28	10.5	83.3	80.6	165.1	59	90	16.1	3.3	3.4
29	11.6	93.3	96.2	171.9	37.6	115.1	19.2	3.5	2.7
30	11.5	90.5	192.9	222.8	58.8	125.4	38.6	3.7	2.9
31	12.2	264.2	164.5	236.8	37.4	166.5	32.9	3.6	2.9
32	13.6	88.3	110.9	161.7	58.8	80.7	22.2	3.8	2.2
33	12.7	78.2	74	212.3	54.6	142.9	14.8	3.9	2
34	8,7	83.2	106.7	181.8	60.6	97.9	23.3	3.2	3.2
Mean	**11.879**	**104.218**	**122.947**	**183.176**	**52.800**	**106.006**	**24.632**	**3.682**	**2.932**
SD	**1.522**	**51.696**	**77.859**	**32.381**	**10.002**	**31.932**	**15.554**	**0=326**	**0.347**

MALE									
	Hb	**Fasting BG**	**TGL**	**TCL**	**HDL**	**LDL**	**VLDL**	**ALBUMIN**	**GLOBULIN**
1	15.2	356.2	95.8	159.8	48.6	92	19.2	3.7	3.3
2	13.8	83.4	81.8	144.7	67.4	60.9	16.4	4.5	3.2
3	15.7	81.1	95	178.3	44.4	114.9	19	4	3.6
4	14.8	84.5	118.4	171.2	58.4	89.1	23.7	4.4	3.7
5	13.6	56.9	69.6	124.3	59.8	50.6	13.9	3.5	3.3
6	14.8	70.4	81.1	189.3	46.8	127.3	16.2	4.3	2.3
7	13.2	78.4	80.4	156.6	65	76.5	16.1	4.3	2.8
8	9.8	125.1	69.9	131.4	52.2	65.3	13	3.4	3.7
9	10.6	103.8	69.4	123.2	47	62.3	13	3.9	3.6
10	11.9	83.1	76.7	158	60.8	81.9	15.8	4	2.6
11	11	103.6	72.9	124.9	66.8	43.5	14.6	3.9	2.9
12	14.4	73.7	70.9	181.9	60.2	107.6	14.1	3.9	3.3
13	14.1	78	91.9	183.5	65.8	109.4	18.3	3.7	3.6
14	14.8	75.1	81	108.6	55	37.4	18.2	4.1	3
15	12.5	97.6	120.5	179.6	50.6	104.9	24.1	3.5	4
16	14	71.7	81.2	183.4	58	109.2	16.2	4.2	3
Mean	13.388	101.413	84.781	156.169	56.675	83.300	16.988	3.956	3.244
SD	1.698	67.650	15.490	25.761	7.420	26.842	3.230	0.324	0.442