NUTRITIONAL PROFILE OF MIDDLE AGED WOMEN OF BELOW POVERTY LINE (BPL) FAMILIES WITH SPECIAL REFERENCE TO MICRONUTRIENTS

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Dedicated To

My Husband Anil Kumar

DECLARATION

I hereby declare that this thesis entitled **"Nutritional profile of middle aged women of below poverty line (BPL) families with special reference to micronutrients"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar title, of any other university or society.

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Introduction

1. INTRODUCTION

Poverty is a complex phenomenon which is not only related with income but also concerned with social, political, environmental aspects and an interaction of all these individual aspects lead to the situation of poverty. People living in the rural areas were not able to lead a life worthy of human beings due to poverty, and their health condition was the result of the pernicious combination of several socio-economic factors like unemployment, lack of materials advancement, poor housing, poor sanitation, malnutrition, social apathy, absence of will power and initiative to change for the better etc.

Poverty has a women's face, of the 1.3 billion people a Below Poverty Line, 70.5 percent are women (World Bank 2003). In India as per the 9th plan 320 million people are living Below Poverty Line, of them 70 percent are women. World Bank (2000) has reported that women in India constitute 48 percent of the total population, and women head one third of all families Below Poverty Line. Patricia (2004) reported that more than 1billion people, most of them are women live in extreme poverty. She has also reported that women are likely to be poor than men and to be among the poorest of the poor.

Poverty has a direct, dramatic and measurable impact on women's health. Women were identified to be the most undernourished, economically the most vulnerable and socially the most depressed group of workers in society, even though they performed tasks essential to any society's survival from raising children to growing food and feeding their family. Hence it is imperative that she should maintain good health. Majority of women population in India are generally more malnourished than men. The poor social and economic back ground of these women superimposed by heavy work load and additional biological demand due to menstruation, pregnancy and lactation is expected to have a negative influence on their nutritional and health status.

In the recent years, there has been a remarkable upsurge of interest in India regarding health and nutrition of women. Realizing the importance of health and nutrition, most of the intervention programmes and researches had previously been focused on serious problems of under nutrition related to the micronutrients deficit (iron, vitamin-A and iodine) and high rates of infections among the vulnerable groups of population i.e. infants, lactating and pregnant women and even among adolescence and older women. But there is a group which most of the intervention programmes for women had totally been ignored i.e. the middle aged group.

Although women live longer on an average than men many do so with chronic diseases especially during middle age, agreeing with the saying that, as age advances out "women get sicker, men die quicker". As they move in to middle age, promoting and maintaining the health of middle aged women has become a nutritional, medical, social, and economic priority. Repeated pregnancies and the responsibility of caring large families, especially in rural or impoverished house holds, put serious strains on mothers health and nutritional status and this will become more 'at risk' when these women become middle age as their families grow larger.

Middle aged women are totally ignored from all nutritional intervention programmes even though they are more prone to major micro nutrient deficiencies like iron, vitamin-A and iodine deficiencies. A survey conducted by Gopalan and Sumeet (1999) among the tribal middle aged women in Orissa reported that dietary deficiencies mainly energy, protein, iron, calcium, and β - carotene were commonly found. Abid et al., (1999) reported that women are more likely to develop hypothyroidism after age 50 and men after age 60. Laisamma (1992) in her study found that the diet of the female agricultural labourers in Thiruvananthapuram were highly deficient in iron, β -carotene, riboflavin and niacin. Ivanova *et al.* (1995) and Moffat (1995) reported that the high prevalence of iron deficiency anaemia was largely due to the result of inadequate dietary iron intake to meet the relatively high iron requirement and

was found most common among women in India with a prevalence rate of 50-80 per cent. Kim (2001) reported that biological and social factors may negatively influence the quality of women's life particularly beyond the age of 45 years. Poor middle age period is a transition to a poor elderly life with greater disability which makes a huge national loss. Deficiency diseases due to poor dietary intake and poor bioavailability of nutrients increase the occurrence of under nutrition among middle aged women of lower economic strata which might contribute to micro and macronutrient deficiencies in elderly.

Along with micronutrients deficiency diseases, middle aged women are also prone to certain degenerative diseases such as hypertension, arthritis, diabetes mellitus, coronary artery disease, osteoporosis, cancers, obesity etc, which often contribute to loss of life, lack of independence and self confidence. Mellner and Christin (2003) have reported that contemporary factors such as job strain, low income, financial worries, double exposure in terms of high physical and emotional changes associated with menopause and heavy domestic responsibilities increased the risk for poor health in middle aged women.

Although micronutrient deficiency is increasingly being recognized as a wide spread problem among middle aged women, there is very limited data on the magnitude and severity of the problem. Recommended Dietary Allowances (RDA) for middle aged women is also not available.

As far as Kerala is concerned, the female population is 50.89 per cent and in Thiruvananthapuram District, it is 50.87 per cent (Economic Review, 2003). Nearly half of them are middle aged and older women. It is stated that iron deficiency anaemia, iodine deficiency disorders and vitamin-A deficiency disorders along with life style diseases like hypertension, cardiac diseases, cancers and diabetes mellitus are reported to be the major nutritional and health problems among middle aged women in Kerala. The dietary habits, food consumption pattern and the micronutrient status play a significant role in such conditions. NNMB surveys have revealed that the consumption of iron was marginally lower and the intake of vitamin- A was about one third of RDA in Kerala. Many

researchers have revealed that the highly deficient diet of the rural and urban women adversely affect their nutritional profile. The statistics now available about the nutritional profile and micronutrient status of the middle aged women in Kerala are highly inadequate and unreliable.

New research findings and research based programme strategies are needed in this area particularly those that improve the overall nutritional and health status of middle aged women. At this juncture studying the health and nutritional profile and micronutrient status of middle aged women particularly belonging to Below Poverty Line (BPL) families is highly essential. Hence the present study was proposed to be conducted with the major objectives to assess the nutritional profile of middle aged women of BPL families with special reference to micronutrients in Thiruvananthapuram District of Kerala State.

Review of Literature

2. REVIEW OF LITERATURE

The relevant literature available on the study entitled "Nutritional Profile of Middle Aged Women of Below Poverty Line (BPL) Families with special reference to micronutrients" have been briefly reviewed here, under the following headings.

2.1 Middle aged women the unnoticed group
2.2 Nutritional profile of middle aged women
2.3 Micro and Macronutrient problems among middle aged women
2.4 Common health problems among middle aged women

2.1 MIDDLE AGED WOMEN, THE UNNOTICED GROUP

According to Finch *et al.* (1999) poor middle aged period is a transition to a poor elderly life with greater disabilities. He also reported that living a period 15 years with disabilities of middle aged makes a huge national loss.

Andres *et al.* (1994) state that deficiency diseases are common in middle aged women of lower economic strata which might contribute to micro and macronutrient deficiencies in elderly. Yamada (2000) had stated that poverty and malnutrition related deficiency illness were the main problem among middle aged women.

Gregory (2000) reported that middle aged women are totally ignored from all nutritional intervention programs even though they are more prone to micronutrient deficiencies like anaemia, Vitamin-A, and Iodine deficiencies. Walker (2001) reported that, there were no nutritional intervention programs for this group.

Stewart (1997) stated that, although women live longer on an average than men, many do so with chronic diseases and malnutrition during middle ages. O'Brien and Vertinsky (1991) reported that because of women's increased longevity and low death rates, older women often

spend a substantial part of their later lives with chronic diseases and disabilities.

Campbell *et al.* (1999) pointed out that, although women in the world today live longer than men, their longevity is offset by their higher rates of illness due to significant medical problems. Asian women live 10 years longer than men, where biological and social factors may negatively impact the quality of women's lives particularly beyond the age of 45 (Kim, 2001).

Root (1998) pointed out that middle aged women are more prone to major degenerative diseases such as cardiac diseases, cancers, diabetes etc. Australian Bureau of Statistics (1998) expressed that RDA for middle aged women are not worked out so far. They also stated that statistics now available about the nutritional and health profile of middle aged women are highly inadequate and unreliable.

Hunter (1993) reported that although micronutrient deficiency is increasingly being recognized as a wide problem, there is very limited nationally representative data on the magnitude and severity of this deficiency mainly among middle aged women.

Avis *et al.* (2000) stated that due to several health implications of the age studying the nutritional and health profile of middle aged women was highly significant. Sandra (2000) pointed out that new program strategies are needed particularly to help middle aged women in overcoming the barrier and improving the over all health and nutritional status. All these points out the urgent need for studying about middle aged women, the unnoticed group.

2.2 NUTRITIONAL PROFILE OF MIDDLE AGED WOMEN

Study conducted by Baker (1999) among middle aged women in Hawaii showed that cereal consumption of 350 g against RDA of 440 g which showed a deficit by 20.46 per cent. The average daily intake of carbohydrate was 328 g by the middle aged women in Scotland. It was

also reported that apart from cereals, carbohydrate rich foods such as potatoes and cheap roots and tubers also formed part of the diet as observed in the study sample of poor middle aged women (Allen , 2000).

Calloway (2001) reported that besides the quantitative poor protein intake quality of protein was also inferior. He also stated that most of the protein in the diet of rural middle aged women comes from cereals and pulses where intake was poor. A study conducted by Deshpande *et al.* (2001) among middle aged farm women in four districts of Bhopal showed an average daily consumption of 20 g pulses against RDA of 45 g.

Fat and oil consumption by the middle aged women was 15 g against RDA of 30 g as mentioned by (Deshpande *et al.*2001). Intake of fat was observed to be 21.4 g in Caribbean middle aged women and intake of invisible fat by this category was observed to be 6.4 g (57.6 kcal) (Huffman, 1999).

According to Sreevastava (2000) in the diets of rural middle aged women the invisible fat was largely derived from cereals, millets and pulses. A comparative study done by Bothwell *et al.* (1989) in the middle aged pregnant and lactating women in France showed that consumption of leafy vegetables was very low for middle aged women compared to pregnant and lactating women.

A report published by Nutrition Consultancy of Guatemala (1997) revealed that average daily consumption of roots and tubers by the middle aged women in Guatemala was 26 g against an RDA of 60 g. The report also stated that consumption of vegetables by the middle aged women was 37.5 per cent against the RDA of 45 g.

Intake of fruits by the middle aged women was 17.8 g which was subjected to seasonal variations in Peru (Ingram *et al.*, 2001). Krishnadev (2002) found that consumption of milk by the middle aged rural women in Nepal was 85 g against an RDA of 160 g showing a reduction of 53.33 per cent.

Consumption of sugar was high for middle aged women in Bihar which was 25 g against an RDA of 20 g (Deshpande et al., 2001). Kuhnlein and Burgess (2005) reported that vitamin-A, iron and iodine were the three micronutrients that are frequently cited for deficiencies in adults, particularly women, in the developing world. Kuhnlein (1984) observed that middle aged women were determined to be at risk for deficiency of these three nutrients by dietary assessments conducted in 1982.

2.3 MICRO AND MACRO NUTRITIONAL PROBLEMS AMONG *MIDDLE AGED WOMEN*

Studies revealed that protein-energy malnutrition, iron deficiency anaemia, vitamin-A deficiency, iodine deficiency disorders and calcium deficiency disorders were the most common nutritional deficiency disorders seen among middle aged women.

Protein-calorie deficiency

Sunder *et al.* (1997) reported that calorie intake was often low among middle aged women in India. Alexander *et al.* (1998) had stated that reduced nutrients and energy intake may increase the occurrence of under nutrition among women aged forty and above.

A study conducted by Sreevastava (2000) in Bihar highlighted that women in their mid years consume 60 per cent less calories than the RDA. The study also revealed that their diet was deficient in protein content.

Study conducted by West *et al.* (1999) showed that protein intake in middle aged women in US appear to be more adequate than calorie intake. Deshpande *et al.* (2001) observed that calorie intake of middle aged women in Bhopal was 1700 Kcals, which was 23.6% less than the RDA. He also opined that besides the quantitative poor protein intake,

the quality of protein was also inferior, of which most of the protein in the diet comes from cereals and pulse intake is poor

In most countries middle aged women often consumed lower quality protein (WHO, 1995). ACC/SCN (2000) reported that among women the prevalence of under nutrition increases with age.

Avis *et al.* (2000) are of the opinion that protein-calorie under nutrition is a major risk factor among middle aged women which increase their morbidity and mortality during older age. Diet survey conducted by Gopalan and Sumeet (1999) among the tribal middle aged women in Orissa reported that dietary deficiencies mainly energy and protein were commonly found.

Iron deficiency anaemia

According to WHO (1998) iron deficiency anaemia is more common in women than in men and about 55 per cent pregnant women and 44 per cent of all women suffer from anaemia in developing countries. The report also indicates that at ages 15-55 years the burden of iron deficiency anaemia in developing countries in terms of thousands of DALY's per year was 4898 for men and 7135 for women. WHO (1998) reported that anaemia lowers the physical work capacity of women and their ability to cope with various infections.

Lawrence (2001) stated that the group most likely to have iron deficiency were young children, teenagers, pregnant women and both men and women over 50 years. Bhaskaran and Krishnaswamy (2003) reported that amongst the numerous trace element deficiencies, iron and iodine are rampant and of public health concern.

Raman and Sharma (2003)stated that in adult men and women, anaemia results in poor work out put since the work capacity is reduced considerably due to muscle fatigue which have great effect on productivity especially in the industrial and agricultural sectors. A study conducted among middle aged women in Andhra Pradesh, India shows

that 80.4 per cent of women had mild to moderate anaemia. The report also stated that 52 per cent of thin women, 50 per cent with normal BMI and 41 per cent of over weight women of middle aged were anaemic (Bentley and Griffith , 2003).

Prevalence of anaemia among middle aged women and the elderly was quite high in developing countries when compared with industrialized countries (Ramakrishnan, 2002). A report published by WHO (2002) about the global database on anaemia shows that women aged 40-59 in countries of South East Asia, Eastern Mediterranean, Africa, Western Pacific, America and Europe had a anaemia prevalence rate of 60, 51, 38, 31, 22 and 10 per cent respectively.

Iodine deficiency

According to definition by Perez *et al.* (1980) a thyroid gland whose lobes have a volume greater than the terminal phalanx of thumb of the subject examined will be considered goitrous. They also reported that prevalence of goiter was generally seen more among females than males. WHO (1996) reported that prevalence of goiter was three times greater in middle aged women than in males.

An epidemiological survey carried out by the Task force of Indian Council of Medical Research (1989) in 14 districts in different states of India, showed a very wide variation in the prevalence of goiter, and the prevalence ranged from 6 percent in Mizoram to about 66 percent in Dibrugorh, and an overall average of 21.1 percent in Assam. The report also pointed out that prevalence was almost double (26.8 percent) among females compared to males (15.5 percent) .

Goitre in middle aged women in Tanzania was found to be 2 – 8 per cent (Franklin *et al.*, 1991). Wood (1999) pointed out the factors that increase a person's risk of developing hypothyroid include age, sex, weight and medical history. A study conducted by ICMR (1989) in ten

states of India shows that 5.1 per cent of women aged 50's have iodine deficiency goiter.

Iodine deficiency is more likely to develop after an age of 50 in women and in men after an age 60 (Ramakrishnan, 2002). Brahmam (2003) pointed out that total iodine content in a healthy adult man is about 15-20 mg, of which 70-80% is present in the thyroid gland. He also pointed out that in developed countries the problem of IDD has been virtually eliminating through implementation of effective control measures such as iodine fortification of bread, salt etc, but it continues to be a major nutritional problem in countries of Latin America, Africa and Asia.

Calcium deficiency

Calcium has been cited as the key to bone health in older adult women, which is important in the prevention of osteoporosis (Grazian, 1999). Ramakrishnan (2002) reported that poor calcium absorption, low dietary, calcium and minerals are the main reasons for osteoporosis in middle aged women.

Many Australian women over 40 years consume insufficient calcium and fiber as reported by Australian Bureau of Statistics (1998). Edben (2000) conducted a study on the relationship between nutrient intake and bone mineral state among 750 women above the age of 50 and reported that those with satisfactory nutrient intake had bone density above that of normal person. The study also shows that 55 per cent of middle aged women had a poor bone mineral density. Elu *et al.* (2000) reported that intake of calcium was very low among middle aged women in Tanzania. A survey conducted by Janklin (2001) among 500 middle aged women in Southern Parts of Peru reported that calcium intake of 268 of them were significantly low. The National Nutritional Survey of Nigeria (2001) showed that, the mean intake of zinc and calcium in women aged 45 to 64 were low.

Rahman (2000) reported that calcium intake of Pakistani middle aged women is 330 mg against RDA of 400 mg. He also stated that poor intake of milk and milk products by the study sample women could be one of the reasons for low calcium intake. Bone health assessment of 100 healthy Scottish women aged 45-55 showed that 82 of them were having osteoporosis.

Mercola and Joseph (2000) pointed out that most studies on nutrition and bone health have focused on calcium intake and paid less attention to the role of other micronutrients. A study conducted by New (2003) in a group of middle aged women of United Kingdom, identified several key micronutrient commonly found in fruits and vegetables are significant to bone health. He also pointed out that these findings point to an important role of fruits and vegetables on the diet in the prevention of osteoporosis, since these foods are primary sources of the micronutrients that assist in maintaining healthy bone.

Haris *et al.* (2004) reported that women who had high current and previous consumption of zinc, magnesium, potassium, fiber, and vitamin-C had greater bone mineral density once they had reached middle age

2.4 COMMON HEALTH PROBLEMS AMONG MIDDLE AGED WOMEN

According to the World Health Organisation "health is a state of complete physical, mental and social well being and not merely an absence of disease or infirmity". According to this definition very few women in this age group enjoy a healthy life. Women are more prone than men to certain diseases such as osteoporosis, diabetes hypertension, nocturnal incontinence and arthritis as well as communicable diseases which often contribute to loss of independence mobility and self confidence (WHO, 2002). Yeolekar *et al.* (2001) reported that women are more apt to suffer from arthritis, high blood pressure and mental

problems, where as men have more heart diseases and intra vertebral disk disorders.

A study conducted by Fullerton (2001) among sixteen thousand women aged 40-45 , representing different ethnic groups in USA showed that one quarter of women had been diagnosed with blood pressure , 23 percent had arthritis, 3 per cent had heart disease and 7 per cent diabetes. Sandra (2000) reported that women with heart problems, arthritis, osteoporosis or those who reported feeling stressed were also more likely to be limited in their ability to perform their daily tasks. She also emphasised the need for programs that help women to over come these barriers and lead better lives.

Wasier (1996) reported that adverse effects of the affluent diet characterized by excess calorie foods rich in fat, refined sugars and sodium, but deficient in complex carbohydrates and potassium have resulted in higher incidence of coronary heart diseases, hypertension and cerebro vascular diseases among middle aged women.

Cardio vascular diseases

Coronary artery disease is the most common cause of death among middle aged women (Pickering *et al.*, 1991). Coronary heart disease and cancer, the two leading cause of mortality in older adults increase dramatically with age (Silventoinen *et al.,2005*).

Manson and Swash (1995) stated that dietary factors may influence the risk of cardiovascular diseases. They also reported that coronary heart diseases the leading cause of morbidity and mortality in the United States is strongly associated with tobacco use dietary factors and physical inactivity.

Most middle aged and older Canadian women continue to die of cardiovascular diseases (Stewart, 1997). Barker (1998) noted a link between low birth weight and the incidence of cardiovascular diseases among middle aged men and women born in the United Kingdom.

Cardiovascular heart disease is the number one killer disease, and is reported to be mainly due to the risk factors like cigarette smoking, obesity, poor life style, elevated serum cholesterol, low levels of physical activity, chronic stress and hostility (Taylor, 1995). The average annual incidence rates per 1000 of cardiovascular diseases in middle aged American women increased with advancing age from 45-55 (Manson and Swash, 1995).

Stewart (1997) reported that many women are unaware that cardiovascular diseases are eight times more likely to kill them than much feared and much publicized breast cancer. Major risk factor for heart disease in women include blood pressure, high LDL cholesterol , low HDL cholesterol , a sedentary life style, poor nutrition, smoking, diabetes and obesity (Wilcox and Stefanick, 1999).

Krishnaswamy and Ghafooranisa (2003) suggested that people in the middle aged and above particularly those with one or more risk factors for cardio vascular diseases should restrict the visible fat intake to the minimum level of 20g/ day. Recent studies have highlighted the growing threat of coronary heart diseases in Indian due to changing life styles and called for greater awareness of the problem.

Cardiovascular disease annually kills more women in the age group 40-55, than all the cancer put together (Yeolekar *et al.*, 2001). He also reported that women in general are still largely unaware of the increasing threat of heart diseases.

Cancer

Certain forms of cancers are mostly seen among middle aged women. These include reproductive cancers like cervical cancers, breast, ovary and uterus cancers, which increases with age (Yeolekar *et al.*, 2001). Breast cancer claims the life of 45,000 American women annually of which ¾ of them constitute of women in the age group 45-55 years (Tinnerello, 1999).

Breast cancer is the leading cancer among women aged 45-64 years (Wilcox and Stefanik, 1999). More over lung cancer has recently surpassed breast cancer as the leading causes of death in women; this is entirely the result of increased rates of smoking among women (Stewart, 1997).

Breast and cervical cancers are the leading causes of death among middle aged women (Yeolekar *et al.,* 2001). Collins (2005) reported that gall bladder disease is three times as likely to occur in middle aged obese women.

Smith *et al.* (1998) reported that reproductive cancers accounted for 38.63 per cent, cervical cancers for 23-47 per cent and breast cancer for 10-22 per cent of all cancer cases among middle aged women in hospitals through out the country. Among reproductive cancers in women, cervical cancers are predominant and this is one of the few cancers that can be readily detected and even treated in its precancerous stages (Thomas, 2000).

Wilk (1995) reported some of the reasons for reproductive cancer are low coverage health service, early sexual initiation, lack of personal hygiene, frequent genital infections, poor obstetric care and hormonal imbalance. Ratnatunka (2002) reported that carcinoma of the genital tract along with breast cancer account for over 50 per cent of all malignancies of middle aged women in Sri Lanka.

Diabetes mellitus

On a global scale, female diabetics out numbered males. Shephered (2000) reported women in mid life are more vulnerable to major chronic diseases of diabetes. He also stated that nearly all women, aged 45-64 years with diabetes, have type II diabetes. Prevalence of diabetes in Thailand was studied by Samuel *et al.* (2001) and revealed that prevalence rates were higher for females than for males in all age groups above 24 years. The report also showed that up to 55 years of age, prevalence rates were relatively similar for urban and rural women.

At 55 years and above, however the rates in urban women were substantially higher. Type II diabetes more frequently seen in women than men.

Women over 45 years of age are twice as likely to develop diabetes than men (Yeolekar *et al.*, 2001). WHO (2003) indicated that male/ female ratio of adults with diabetes mellitus ranged from 1.05:1.45.

The risk of developing NIDDM is 40 times greater in women with a BMI of more than 22 in the age group 30 to 55. Middle aged people with diabetes have death rates twice as high and heart disease death rates about two to four times as high as middle aged people without diabetes (Brownlee, 1996).

Diabetes is a leading cause of death among middle aged American women (Meer *et al.*, 1995). Champion (2000) reported that there is very little reliable national data from countries of the region on the prevalence of diabetes mellitus among middle aged women.

Obesity

Okake *et al.* (1983) pointed out that incidence of obesity was found to be directly proportional to the increase in age of women. Over weight and obesity in women aged 40 and over are mainly due to consumption of saturated fat and lack of proper regular physical activity (Hays *et al.*, 2002).

Women are more prone to develop obesity than men. Obesity is common among people after the age of 35 years, and is related with food consumption pattern and work (Begum, 1991). Obesity (BMI>30) is more common among women and proportion of women increase with increasing severity of obesity (Garrow, 2002). Females have a tendency to channel extra energy in to fat storage while males utilize more of this energy for protein synthesis.

According to Saltzmann (1995) waist circumference >89cm for women and >102cm for men increase the risk for CHD. Obesity is

associated with a number of non communicable diseases such as cardiovascular disease, diabetes mellitus, certain forms of cancer and liver disease, imposing a massive burden of disability of death.

Greater risks of endometrial, ovarian, cervical, post menopausal breast cancer have been documented for obese women. Samaras (1997) stated that obesity cannot be separated from effects of the decrease in physical activity which commonly accompanies ageing.

A study conducted by Jain and Singh (2003) among sedentary workers aged 25-50 years in Jaipur city shows that women in age range of 45-50 years had the highest percentage (68.42%) of Grade- 1 obesity followed by 35-45 years group (56.6%)

ACC/ SCN (2000) reported that the burden of obesity is becoming greater among the poor than among the higher-income groups. Obesity, poverty and medicinal problems can add years to their chronological age of women in their 40s and 50s (Devish, 2001).

Significant proportion of women aged 40 and above are over weight, co existing with high rates of malnutrition (Kim, 2001). Half of all women in Australia over 45 years of age are over weight or obese (Davy *et al.*, 1996).

Weight gain in middle life is common among women. An increasing incidence of obesity may evolve as a major concern in the region, especially for middle aged women with far reaching implications for health. Mortality rates increase 100 per cent in overweight persons as compared to about 25 per cent in under weight persons (Tamber, 1999).

More than ½ of the middle aged women in developing countries are over weight (Meyer, 2000). According to recent study by Pope (2003) obese middle aged women are nearly twice more likely to have substantial physical limitations than women of over weight. The study also reports that, those women in their 40s and 50s are more likely to have trouble with their daily activities.

The total energy needs of an individual vary depending up on age, sex, basal metabolic rate and physical activity and the energy intake should be in balance with energy expenditure. When energy output is lower than energy intake, obesity or fat deposition occurs (Burns, 2000). He also reported that 32% of black Caribbean women are obese (BMI>30Kg/m) compared with 20% Indian women, 26% Pakistani women , 21% Bangladeshi women and women in the general population (21%).

Hypertension

More women than men in age group 45-55 reported to be suffering from hypertension and heart disease (Pickering *et al.*, 1991). National Health Survey conducted in Thailand (1991) found a higher prevalence of hypertension in women aged 45 and above as compared to their male counter parts. The report also stated that prevalence rate, were substantially higher in urban women than in those from rural areas.

Eyan (2000) reported that middle aged women with a BMI > 25 have a higher incidence of hypertension. A nutritional health survey conducted by US Department of Health and Human Statistics (2001) in USA found a higher prevalence of hypertension in women 45 years and above as compared to their male counterparts.

A study conducted by Victor and James (2002) in Myanmar showed a hypertension rate of 17.7 per cent among middle aged women.

Arthritis

Women spend twice as long as being disabled than men due to mainly muscle and joint problems which is more often found among middle aged women (Silman, 1987). With an increase of ageing female population, chronic diseases like arthritis and osteoporosis are becoming a major handicap. In today society disproportionately more older women than men are affected by arthritis. The effects of these disorders on

independent living quality of life, mobility and morbidity make them *important concerns in women's health* (Stewart, 1997).

Helmick (2002) reported that arthritis is also the leading cause of disability and is associated with considerable functional limitations in middle aged women. A study conducted by Victor and James (2002) among middle aged women in Myanmar shows that 38.9 per cent of them are the victims of arthritis.

Osteoporosis

Osteoarthritis is a common complication of obesity especially in weight bearing joints such as knee and hips (Garrav, 2002). The risk of osteoarthritis is related to the total amount of fat, rather than to the extent of abdominal fat. Hip fracture is expressed as a negative proportion and 3.5% of people who are excessively over weight or obese are less likely to experience a hip fracture than those who are under weight. Radack *et al.* (1999) reported that after the age of 45 more women than men develop osteoarthritis.

Poor calcium absorption, low dietary calcium and minerals are the main reasons for osteoporosis in middle aged women. A study conducted by Marcus (1999) on osteoporosis revealed that up to 55 years of age, prevalence rates were relatively similar for urban and rural women, whereas the rates in urban women were substantially higher after 55 years.

A study conducted by Suki (2001) among Thai women, indicated that bone loss in women accelerated after the age of 49, corresponding with the age of on set of menopause. Paul (2002) reported that approximately 70 per cent of fractures in people aged more than 45 years being due to osteoporosis.

Postmenopausal women suffered more joint damages than pre-menopausal women, possibly due to the decrease in bone density that occurs when oestrogen levels fall as reported by (Helmick,. 2002).

According to Mercola and Joseph (2000) intake of nutrients found in abundance in fruits and vegetables- namely, potassium, beta carotene, vitamin-C, and magnesium were positively associated with bone health. They also reported that potassium appears to slow the excretion of calcium from the body, and magnesium increases the rates of bone formation. Vitamin-C appears to aid in bone formation were magnesium is extremely important in skeletal metabolism. The study also stressed that magnesium deficiency may also contribute to osteoporosis.

Menopause related problems

Wilk (1995) stated that, as women approach midlife they are likely to experience physiological changes associated with menopause along with changes in family relationship, body image, role and purpose of life. He also reported that for some women, these changes may cause depression, anxiety and lowered self- esteem.

Waril *et al.* (1998) stated that up to 50 per cent of women going through menopause experience discomfort in their joints. They conducted a study among 10,600 Australians and found that 8.5% of women aged over 40 years experienced depression, and that women were nearly twice as likely to experience affective disorders than men (4.2%).

Wing *et al.* (1999) reported that women during the period of menopause were found to be more distressed physically and mentally due to the drop in oestrogen level. After menopause the prevalence of coronary artery disease appearance to be more common in the middle aged women (Krishnaswamy and Ghafoorunissa, 2003).

Munger *et al.* (1999) reported that menopause is associated with the onset and progression of osteoarthritis and rheumatoid arthritis in women. Lingsten (2002) pointed that depletion of hormone at menopause cause specific morbidity and mortality including cardiovascular disease in women aged 49 and above. Stamfer *et al.* (2003) reported that

menopause is associated with the onset and progression of osteoarthritis and rheumatoid arthritis.

Materials and Methods

3. MATERIALS AND METHODS

The study on nutritional profile of middle-aged women of below poverty line (BPL) families with special reference to micronutrients comprises a documentation of systematic investigations, to ascertain the dietary habits and micronutrient status of middle-aged women and to elicit information on the various factors, which may influence their nutritional and health status.

Materials and methods chosen for the study are presented under

3.1 Locale of the study

3.2 Selection of subjects

3.3 Selection of tools

3.4 Mode of data collection

3.5 Investigations on macro samples (300 nos)

3.5.1 Socio economic and demographic profile of the subjects

3.5.2 Personal profile

3.5.3 Dietary profile

3.5.4 Energy balance studies

3.5.5 Stress and strain

3.5.6 Anthropometric measurements

3.5.7 Clinical assessment

3.5.8 Health and reproductive history

3.5.9 Haemoglobin level

3.6 Developing Nutritional Status Index

3.7 Selection of micro samples

3.8 Investigations on micro samples

3.8.1 Actual food intake (food weighment method)

3.8.2 Micronutrients in food samples

3.8.3 Micronutrients in blood and urine samples

3.9 Statistical analysis of the data collected

3.1 LOCALE OF THE STUDY

The locale of the study was limited to Neyyatinkara Taluk of Thiruvananthapuram District of Kerala State. The basic criteria for selection of this Taluk were due to their proximity to Kerala Agricultural University, Vellayani, which enables easy accessibility to the study area. Since in depth study need constant and frequent contacts with the subjects. Another reason for selection of this Taluk was particularly due to the availability of more numbers of BPL families.

3.2 SELECTION OF SUBJECTS

As envisaged in the program 300 women belonging to the age group of 40-55 years from Neyyatinkara Taluk, were selected from the Below Poverty Line (BPL) survey list of Govt. of Kerala (1991) The selection of the subjects from the BPL survey list was conducted adopting stratified multistage random sampling technique with two blocks as the I stage, two panchayats in each blocks as the II stage, three wards from each panchayat as the III stage and twenty five subjects from each wards as IV stage, thus constituting a sample size of 300 women. Subjects were randomly selected based on their willingness to participate. Fig -1 represents the flow chart, adopted for the selection of macro samples.

Out of the four developmental blocks of Neyyattinkkara Taluk, *i.e.* Nemom, Athiyannoor, Perumkadavila and Parassala, two blocks namely Nemom and Athiyannoor were purposevily selected. From Nemom block two panchayats namely Kalliyoor and Vilavoorkal and from Athiyanoor block, Vengannoor and Vizhinjam panchayats were selected for the study. Three wards each from individual Panchayats were selected, and further 25 women from each wards were randomly selected from 12 wards, thus constituting a sample size of 300 subjects.

3.3 SELECTION OF TOOLS FOR DATA COLLECTION

Success of every research study depends upon the use of appropriate and well designed tools or technique to elicit information from the samples.

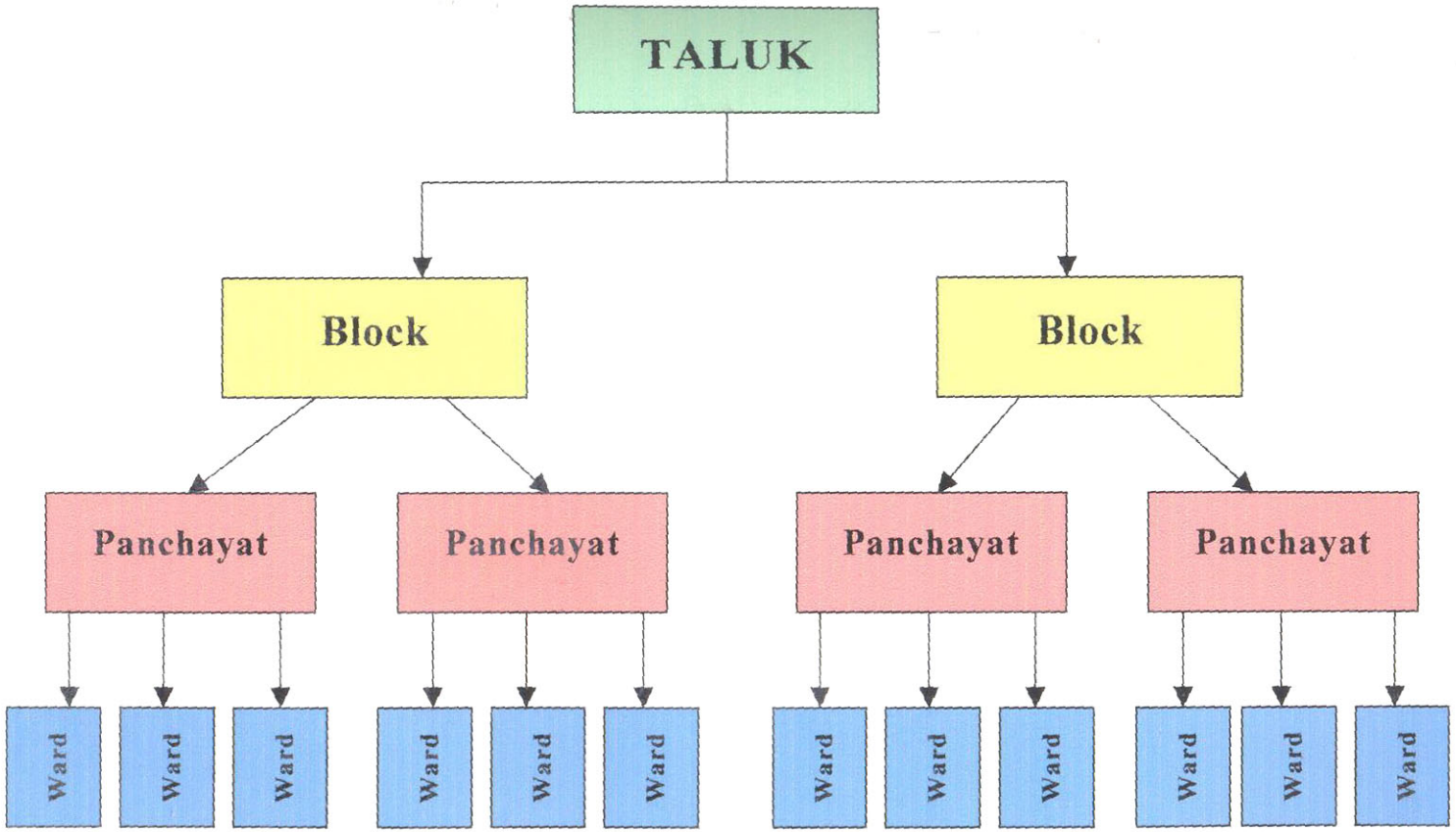

Fig. 1. Flowchart showing selection of area

The standard tools which were found to be appropriate for the present study were used. Oral questionnaire was used as a tool to conduct survey, to find out the socio-economic, health and dietary pattern of the subjects. A schedule formulated has appropriate questions for obtaining required data related to the health and nutritional profile of the subjects. These questionnaires were pre-tested and standardized before administering among the subjects.

3.4 MODE OF DATA COLLECTION

Interview method was selected in the study, since this method was reported to be a suitable way to proceed systematically and quickly to collect information. In this method, there is a face to face interchange between the interviewer and subjects before eliciting information, and the information collected was found more reliable, as the accuracy of the statement were checked by supplementary questions where ever necessary.

This method was utilized for gathering information's regarding socio economic characteristics, nutritional and health variables, using suitably structured questionnaire. Same method was also administered for dietary assessments, anthropometric and clinical studies.

3.5 INVESTIGATIONS ON MACRO SAMPLES

Investigations on macro samples were done among 300 middle aged women, selected. Using the pre-tested questionnaire details pertaining to the subjects and their family members were collected.

3.5.1 Socio Economic and Demographic Profile of the Subjects

The socio-economic level of the subjects such as social, economic, religion and family back ground in general have a very distinct part to play in determining the attitude and food consumption, health and behavioral pattern of the individual. Meer *et al.* (1995) had opined that the social and economic condition in which one lives is said to have a direct impact on food habits and nutritional status.

Comprehensive information of samples with special reference to socio economic and demographic details of their families was collected from the subjects. Details such as age, religion, caste, family type and size, occupation, educational status, marital status, possession of assets, monthly income, utilization of health care facilities etc were ascertained using interview schedule (Appendix I) which was modified and structured after circulation among experts, and conduct of pilot study. From the socio-economic data the physical quality of life of families was assessed for computing rural quality life index (RQLI) using the indicators suggested by Dhanasekharan (1991). Poverty index was also calculated to identify the most important risk factors as suggested by Srilatha and Gopinathan (1995).

3.5.2 Personal Profile

Information on personal profile, like age, occupation, educational status, social participation, personal habits were collected to see if these characteristics have influenced the dietary habits of the subjects. Personal habits assessed in this study included smoking, alcohol abuse, tobacco chewing, and personal hygiene. The information on personal habits was collected by personal interview technique, using standardized schedule (Appendix II).

3.5.3 Dietary Profile

Diet survey constitutes an essential part of any study on nutritional status of individual or groups providing essential information on nutrient intake levels, sources of nutrients, food habits and food behavior pattern. A specially designed questionnaire pre-tested and modified suitably was used (Appendix III) to collect information from the three hundred subjects, on account of their dietary pattern and food habits.

The questionnaire consisted of questions regarding the food habits, frequency of purchase and use of various foods, meal timings, meal pattern, food preference, food preparations and cooking methods commonly used. Twenty four hour recall method was used to estimate the subjects daily dietary intake. In recall method a

set of 'Standardized Cups' suited to local conditions were used. The individuals interviewed were asked a systematic series of questions to ensure, recollection and description of all foods and drinks consumed in the 24 hours before the interview, with emphasis on food consumption meal – by – meal. From the twenty four hours recall survey food adequacy and nutrient adequacy were computed.

Food use frequency

A food use frequency score sheet was also included in the diet survey schedule. Since the frequency of use of different food groups would give and indication to the adequacy of the family diet pattern. Based on the frequency of use of various food items by the subjects food use frequency scores were calculated using the formula

$$\text{Percentage of total score} = \frac{R_1S_1+R_2S_2+\ldots\ldots\ldots\ldots R_n\,S_n}{n}$$

S_n = Scale of rating

R_n = Percentage of subjects selecting rating

n = Maximum scale rating

Based on the percentage score obtained the food articles were classified into several groups, ie never, occasionally, once in a week, twice in a week, thrice in a week, once in month, and daily.

3.5.4 Energy Balance Studies

A regular and balanced diet is essential for proper maintenance of health and nutritional status of every individual. More over there should be a balance between the energy intake through food and the energy required to meet ones daily activity. In order to determine the energy adequacy (1) time utilization pattern and (2) energy balance were studied among 300 middle aged women (Appendix IV).

(1) Time utilization pattern

In order to describe the health problems of women in the context of their activities, a descriptive study of different activities both inside and outside the home has to be carried out, for measuring the energy expenditure in a natural environment (Vazquez *et al.*, 1991).

In order to assess the life style and work load of middle aged women and its relation to their nutritional status, the time utilization pattern of the subjects were studied.

The method suggested by Bray (1991) was used for the study. According to this method, all the activities and time spend for each activity by the subjects were documented by keeping a diary (time log) through out the 24- hours of a day, starting from the time she wakes up in the morning to the time she retires to bed at night. The average workload per day was thus computed by finding the number of hours spends inside and outside home for each activity. From the time log, the time spent for each activities was calculated which was then classified as sedentary, light, moderate and heavy to estimate the energy spent for each type of activities.

(2) Energy balance

Energy expenditure from a physiological point of view is made up of two factors, BMR and physical activity. Energy requirement of the subjects were determined by monitoring their time utilization pattern and by measurements of energy expenditure. Energy expended during different activities in a day can be computed from the available data on energy cost of different activities. The energy expenditure was computed by multiplying the time spent on a particular activity by the rate of energy expenditure which was expressed in BMR units as given by ICMR (1994).

Energy balance was computed for 300 subjects as an indicator for health status. Energy balance of each subject was computed from the total energy intake and expenditure. The energy intake of the subjects per day was estimated from the

actual quantity of food consumed using energy value of food. The values obtained for energy intake and expenditure was then compared with RDA for adult women, to find the adequacy of intake.

3.5.5 Stress and Strain.

Women experience several physical and emotional distresses, which may follow from interactions between biological changes and psycho social life. Mellner and Christin (2003) reported that contemporary factors such as job strain, low income, financial worries and double exposure in terms of high physical and heavy domestic responsibilities increased the risk for poor self- reported health in middle aged women.

In this study an attempt was made to study the contemporary factors of stress and strain among the subjects

Stress and strain were measured by a scale developed by Townsend (1999) after certain modification.

3.5.6 Anthropometric Measurements

Anthropometry has been accepted as an important tool for assessment of nutritional status, which provides the single most portable, universally applicable, inexpensive and non-evasive technique for assessing the size, proportions and composition of the human body.

Anthropometric measurements used in this study included measurement of height, weight, triceps skin fold thickness, mid upper arm circumference, waist and hip circumference. These were measured using standardized techniques as detailed below.

(a) Measurement of weight

According to Kaul and Nyamongo (1990) a change in body weight may be the result of changes in the health of an individual, changes in food consumed or even changes in one's physical activity. Body weight is the most widely used and

Plate :1 measurement of Body Weight Of the subjects

Plate-2 measurement of Waist circumference Of the subjects

the simplest reproducible anthropometric measurements for the evaluation of nutritional status of individuals.

In the study weight was measured using a platform balance as the technique suggested by Jelliffee (1966).

(b) Measurement of height

Height or the total length, a part from nutritional and environmental factors, is influenced by hereditary factors. Height of the subjects was recorded using a stadiometer employing the technique suggested by (Jelliffee, 1966).

(c) Body mass index

Body mass index is expressed as the ratio of weight to height square.[weight(kg) / height^2 (m)] (James *et al.*, 1988).This is used as a good parameter to grade chronic energy deficiency and is regarded as a good indicator of nutritional status. From the recorded weight and height, Body Mass Index (BMI) was computed. Based on the BMI subjects were classified into underweight, normal and overweight.

The presumptive diagnosis of underweight, includes severe (<16.00 kgm^{-2}) moderate (16.00 – 16.99 kgm^{-2}), and mild (17.00 – 18.49 kgm^{-2}) where as over weight includes grade I (25.00 -25.99kgm^{-2}), grade II (30.00 – 39.99 kgm^{-2}) grade III (> 40.00 kgm^{-2}) and in case of normal it is 18.50 – 25.00 kgm^{-2} .

(d) Triceps Skin Fold Thickness (TSFT)

The importance of measuring body composition in relation to problems of nutrition is now becoming more apparent. In this, subcutaneous fat was measured using a Skin Fold Caliper with arm hanging relaxed at the side. As the fat in this region is not uniform, the site was carefully selected halfway down the arm between the tip of acromion process of the scapula and the olecranon process of the ulna. The skin fold parallel to the long axis was picked up between the thump

Plate-3 measurement of Hip circumference Of the subjects

Plate-4 measurement of Arm circumference Of the subjects

and forefinger, about one cm above the midpoint taking care not to include the underlying muscle (Jelliffee, 1966).

(e) Mid upper arm circumference (MUAC)

Measurement of mid upper arm circumference is the most useful practical method for assessing muscle mass, as this region is easily accessible and measurement requires only a flexible fiber glass tape.

Mid upper arm circumference of the subjects were measured to the nearest 0.1 cm with a fiber glass tape placing it around the left arm, hanging freely without exerting too much pressure on the soft tissues. The reading was taken to the nearest 0.1cm as per the technique suggested by (Jelliffee, 1966).

(f) Waist hip circumference

According to Lean *et al.* (1995) waist circumference is used as a measurement for indicating the need for weight management and in the present study the circumference of waist was measured by passing a fiber glass tape around the waist, and for hip measurements, the circumference of hip at the maximum point of proleons was measured using fiber glass tape as per the technique suggested by Bray (1991)

After recording waist and hip measurements of the subjects their Waist Hip Ratio was calculated by dividing the circumference of waist by the circumference of hip as suggested by Chandha *et al.* (1995)

3.5.7 Clinical Assessment

Clinical examination is one most important part of the nutritional assessment, as one gets the direct information on the signs and symptoms of dietary deficiency prevalent among people. It is the simplest method used in the evaluation of nutritional status. In this study the prevalence of clinical signs and symptoms among the subject due to dietary deficiencies or excess w ere assessed to find out the effect of the dietary pattern on their clinical profile. Clinical

examination was done with the help of a trained clinical practitioner using the standardised schedule (WHO, 1997) (Appendix V).

The clinical profile of the subjects was scored based on the presence or absence of clinical symptoms of deficiencies or excess of nutrients.

3.5.8 Health and Reproductive History

Details related to the health and reproductive history were also collected from the subjects, in order to gather accurate account of their health complaints and to see this against the background of their life as a whole, using standardized interview schedule. (Appendix VI).

3.5.9 Haemoglobin Level

Biochemical investigation of haemoglobin is one of the most important tools for assessing the nutritional status of the subjects in any nutrition survey. Park and Park (1997) reports that haemoglobin level is a useful index of the overall state of nutrition irrespective of its significance in anaemia

Haemoglobin levels formed a satisfactory index for determinating iron deficiency for survey purpose and in the present study haemoglobin content of the 300 subjects were estimated by 'cyanmethaemoglobin' method (Dacie and Lewis, 1984).

3.6 DEVELOPMENT OF NUTRITIONAL STATUS INDEX (NSI)

In the present study Nutritional status of the 300 middle aged women were assessed by developing a nutritional status index. The variables, such as Height, Weight, Skin fold thickness, Mid-upper arm circumference, Waist circumference, Hip circumference, and Energy balance, were taken in to consideration as to develop the index (Ottesen *et al.*, 1989).

The NSI was worked out using the formula

$$Ni = \frac{K}{wi} \sum xij$$

Where i = 1, 2, 3.....N

$N = 300$

k = number of variable

$wi = 1/ si^2$ where

si^2 = variance of i^{th} variable based on sample of N size or the information supplied by the sample with respect to i^{th} character

xij = observation corresponding to the j^{th} subjects with respect to i^{th} variable

Nutritional Status Index obtained for each individual was classified as given below:

Mean – SD = low
Between mean ± SD = median
Mean + SD = high

3.7 SELECTION OF MICRO SAMPLES (30 NUMBER)

Beside the major sample a sub sample of 10% (30 Numbers) of the subjects from the macro sample having lower and higher nutritional status index were selected for in depth study (15 with high NSI and 15 with low NSI).

3.8 INVESTIGATIONS ON MICROSAMPLES

Investigation on the prevalence of diet related diseases, actual food intake, collection of food, blood and urine samples of the subjects were done for further analysis.

3.8.1 Actual Food Intake of the Subjects

Availability of food in the house hold alone does not guarantee access to food by individual family members. So in order to assess the food intake of 30 middle aged women, weighment survey was carried out. One day food weighment survey was conducted to assess the food consumption pattern of middle aged

women using the standard technique suggested by Thimmayamma and Rao (1996).

A single day weighment was resorted, since the subjects were from below poverty line families of rural areas, where the probability of diet being monotonous is high. In this method, information regarding the quality and quantity of actual food, meal, menu and the weight of each of the raw food that has gone in to the menu of each meal and weight of cooked foods were measured and recorded. Food intake per person per day was calculated from the above data using the formula suggested by Thimmayamma and Rao (1996). The quantity of food consumed by the subjects was also weighed, and recorded.

From the actual food intake data, nutrient intake of the middle aged women were computed by referring to food composition tables.

The adequacy of the diet consumed by the respondent was assessed by comparing the actual food and nutrients intake with recommended nutrient and dietary allowances.

The schedule used for evolving such information is given in Appendix XI. $1/10^{th}$ portion of each meal consumed by the subjects in a whole day were collected and pooled together for further nutrient analysis.

The following analysis was done in the food samples collected during food weighment survey.

3.8.3 Estimation of Macro and Micro Nutrients in Food Samples

Macro and micronutrient deficiencies result from inadequate dietary intake, poor bio-availability from gastrointestinal tract, excessive losses, increased requirements or a combination of these factors (ICMR, 2001). Now it is realized that iron, iodine and vitamin A deficiency disorders were the three major micronutrient deficiency disorders among the different sections of population irrespective of caste, sex and social status.

The food samples collected from the subjects, during one day weighment survey were analyzed for the following nutrients using standard techniques.

Table- 1 Methods used to study food samples

Parameters studied	Methods
Protein	*Estimation of protein content in food samples* were done by estimating the nitrogen content through Kjeldahl method and then multiplied the nitrogen value obtained by 6.25 (Raghuramulu *et al.*, 2001).
Calcium	Calcium in food samples was estimated by calorimetric method (Raghuramalu *et al.*, 2001).
β -carotene	β -carotene was estimated calorimetrically by (Srivastava and Kumar, 1994)
Iron	Food iron was measured by the procedure given by (Raghuramulu *et al.*, 2001.)
Iodine	Iodine content in food samples was estimated using the procedure (Raghuramulu *et al.*, 2001).
Fibre	Fibre content in food samples was estimated using the procedure given by (Srivastava and Kumar, 1994).
Vitamin C	Vitamin c content in food samples was estimated using the procedure suggested by (Srivastava and Kumar, 1994).
Bio available	*In vitro* digestion was carried out using the β- carotene method suggested by Garrett *et al.* (1999), which is based on the release of carotenoid from samples after digestion with pepsin- Hcl and subsequent treatment with pancreatic-bile extract mixture at physiological conditions to protect from oxidation. After in vitro digestion the sample was analysed using the procedure given by (Srivastava and Kumar, 1994)
Bio available iron	Bio available food iron was estimated by the procedure standardized by(Rao and Prabhavathi, 1978)

3.8.4 Estimation of Micro Nutrients in Blood and Urine Samples

Bio chemical tests are powerful tools for assessing nutritional status, since bio chemical correction is expected to precede clinical recovery (Bamji *et al* ., 2003). She also stated that biochemical tests for micronutrient deficiencies could be conducted on easily accessible body fluids such as blood and urine. In order to determine the magnitude of micronutrient deficiencies among the middle aged BPL women, the following analysis were conducted by adopting the methods mentioned below.

3.8.4.1 Estimations in Blood and Urine samples

Variations in the intake of different nutrients in the diet are reflected by changes in the concentrations of nutrients in blood and urine.

Blood and urine samples collected from the subjects were analyzed for the following parameters using the standard techniques outlined below

Table 2. Methods used to study blood and urine samples

Parameters studied	Methods
Haemoglobin	Method for haemoglobin estimation was from Dacie and Lewis (1984)
Bio-available β-carotene	Bio-available β-carotene in food samples were carried out using the procedure suggested by (Raghuramalu *et al.*, 2001)
Bio-available iron	Bio available iron was done by adopting the procedure (Raghuramalu *et al.*, 2001)
Urinary iodine	Urinary iodine was determined according to the procedure out lined by Henary (1974)
Bio-available iodine	Urinary iodine was subtracted from dietary iodine

3.9 STATISTICAL ANALYSIS

The data collected was coded, scored and consolidated before subjecting to statistical analysis and interpretations. Data collected through the above mentioned methods and procedures were analysed using suitable statistical tools.

Results

4. RESULTS

The present study was conducted among the selected 300 middle aged BPL women in Neyyatinkara Taluk of Thiruvananthapuram district of Kerala state. Keeping in view of the objectives set for the study the data collected from the macro and micro samples were statistically analyzed and the results are presented in this chapter under different sections.

4.1 Socio-economic and demographic profile of the macro samples

4.2 Rural quality life index

4.3 Poverty index

4.4 Personal profile

4.5 *Health and reproductive history*

4.6 Stress and strain

4.7 Nutritional profile

4.7.1 Dietary profile

4.7.2 Anthropometric profile

4.7.3 Clinical status

4.7.4 Haemoglobin level

4.8 Energy balance studies

4.9 Nutritional status index of the macro samples

4.10 Actual food intake of microsamples (Weighment method)

4.11 Micronutrient profile

4.1 SOCIO-ECONOMIC AND DEMOGRAPHIC PROFILE OF THE MACRO SAMPLES

The socio-economic and demographic profile of the middle aged women and their families were assessed by interview method.

4.1.1 Socio-economic and Demographic Profile of the Families

The socio-economic and demographic profile of the families were studied with reference to age, religion, caste, type of family, educational status, employment status, family income and expenditure pattern, nature of assets, economic liabilities and savings. The results of the data collected on these lines are presented below

Religion and caste of the families

Religion and caste are found to be two important variables which will determine the social status of families in a tradition bound social situation that prevails in India. Hence these two parameters were taken into account, and it was found that 247(82.00%) families belonged to Hindu community while 44(15.00%) were Christians and 9(3.00%) of the families were Muslims.

Table-3 Religion and caste wise distribution of families

Religion	Distribution of families	
	No	Percent
Hindu	247	82.00
Christian	44	15.00
Muslim	9	3.00
Total	300	100.00
Caste		
Forward caste	27	9.00
Other back ward caste	133	44.33
Schedule caste	137	45.67
Schedule tribe	3	1.00
Total	300	100.00

The caste wise analysis of the families summarized in Table 3 brings out the fact that majority (45.67 %) belonged to scheduled caste, while the other back ward caste constituted 44.33 per cent. The data further revealed that the forward caste constituted 9.00 per cent and scheduled tribe 1.00 per cent.

Type and size of the families

The type and size of family in which the women live may partially or wholly influence their dietary habits. The distribution of the families according to the type and size are presented in Table 4.

Table-4 Distribution of family type and size

Type of families	Distribution of families	
	Number	Per cent
Nuclear	189	63.00
Joint	38	12.67
Extended	73	24.33
Total	300	100.00
Family size		
Small family (below 5 members)	189	63.00
Big family (> 5 members)	111	37.00
Total	300	100.00

It was found that, out of the 300 families surveyed 63.00 per cent were nuclear type families, while extended families constituted 24.33 per cent and joint families 12.67per cent. The data further revealed the fact that 63.00 per cent of families had a family size below 5 members while 37.00 per cent had family size above 5 members.

Age and sex wise distribution of family members

In order to estimate the needs of any population, information on its demographic characteristics like the total population, age and sex are needed. The composition of families based on age and sex are given in Table 5.

Table-5 Distribution of family members according to their age and sex

Age (Years)	Male		Female		Total	
	No	Per cent	No	Per cent	No	Per cent
<1	7	1.06	11	1.53	18	1.30
1-3	8	1.21	14	1.95	22	1.59
3-6	24	3.63	14	1.95	38	2.76
6-9	27	4.08	20	2.79	47	3.40
9-12	22	3.32	28	3.91	50	3.62
12-15	47	7.10	49	6.83	96	7.00
15-18	54	8.16	37	5.16	91	6.60
Total	189	28.55	173	24.13	362	26.25
18-39	100	15.11	135	18.83	235	17.04
39-55	277	41.84	307	42.82	584	42.34
Total	377	56.95	442	62.65	819	59.40
>55	96	14.50	102	14.23	198	14.36
Grand total	662	100.00	717	100.00	1379	100.00

The age and sex based distribution of the population as presented in Table 5 revealed that 300 families surveyed had a total population of 1379 members. It was found that the number of female population (717) out rates the male (662).When the age and the sex of the selected population were examined in

detail, it revealed that of the total population of adults contributed 59.40 per cent, children up to 18 years contributed 26.25 per cent and elders 14.36 percent. Further analysis of family composition revealed that the female population was greater for adult and elders, while male was greater in case of child population. The sex ratio in the present study was found to be 1000:1083.

Educational status of family members

Table-6 Distribution of family members in accordance with their level of education

Level of Education	Distribution of family members					
	Male	Per cent	Female	Per cent	Total	Per cent
Adult illiterate	30	2.24	45	3.36	75	5.60
Lower primary	176	13.14	126	9.41	302	22.54
Upper primary	310	23.15	271	20.24	581	43.39
High school	99	7.39	182	13.59	281	20.99
Pre degree / certificate course	26	1.94	44	3.86	70	5.28
Graduate	5	0.37	13	0.97	18	1.34
Post graduate	1	0.075	11	0.82	12	0.9
Total	647	48.305	692	52.25	1339	100

The educational level of the family members (Table-6) revealed that there were 75 adult illiterates which constitute 5.60 per cent of the total population. The data further revealed that 22.54 per cent had lower primary education whereas 43.39 per cent had upper primary education and 20.99 had gone to high school. It was also seen that 1.34 per cent were graduates and 0.90 per cent post graduates. The data evidenced that females had attained higher education compared to males.

Employment status of family members

Distribution of family members according to their employment status is given in Table 7.

Table 7 Employment status of family members

Employment Status	Distribution of population				Total	
	Male		Female			
	No	Per cent	No	Per cent	No	Per cent
Employed member	474	71.60	218	30.40	692	50.18
Unemployed member	188	28.40	499	69.60	687	49.82
Total	662	100.00	717	100.00	1379	100.00

The data revealed that, employment status of males (71.60%) dominated over females (30.40%). At the same time unemployed female population out rated males at an average of 69.60 per cent and 28.40 percent respectively. Out of the total population 50.18 per cent were employed, while 49.82 per cent were not having any employment.

Table-8 depicts the number of persons employed in the families

Table -8 Distribution of families according to the number of persons employed

Number of employed person	Number of families	No of person	Percent
1	60	60	20.00
2	108	216	36.00
3	112	336	37.33
4	20	80	6.67
Total	300	692	100.00

Distribution of number of employed person as indicated in Table 8, revealed that 20.00 per cent of families had one employed member, whereas 36.00 per cent of families had two employed members, 37.33 per cent had three members employed and remaining 6.67 per cent had four members employed

Table- 9 Distribution of families according to the days of employment in a month.

Days of employment in a month	Distribution of employment	
	Number	Per cent
5-10	60	8.67
11-15	211	30.49
16-20	257	37.14
21-25	144	20.81
26-30	20	2.89
Total	692	100.00

The distribution of family members according to the days of employment in a month revealed that out of the 692 employed members from 300 BPL families surveyed, only 2.89 per cent of the employed members had employment above 25 days. Data revealed that 30.49 per cent of members were getting employment ranging from 11-15 days, whereas 37.14 per cent of employees were getting 16-20 days of work.

Total family income

In the present study the total family income was taken into consideration because it determines the family's status and the socio-economic status in the society to which they belong.

Table 10 Distribution of families according to total family income (monthly)

Income (Rs)	Distribution of families	
	Number	Per cent
501-1000	80	26.67
1001-2000	189	63.00
2001-3000	31	10.33
Total	300	100.00

Table - 10 revealed that 63.00 per cent of families had a monthly income ranging from Rs 1000 to Rs 2000 whereas 26.67 per cent of families had a monthly income of Rs 501 to Rs 1000. It was also noted that only 10.33 per cent of families were having an income between Rs 2001 to Rs 3000.

Total family food expenditure (monthly)

The economic status of families depends not only on their income, but also on the expenditure pattern. Expenditure on food is one of the important and unavoidable items of family expenditure. Hence the details of expenditure were assessed in the study. Table 11 gives information related to the total monthly expenditure of the family on food items.

Table 11 Distribution of families according to monthly expenditure on food items

Monthly expenditure (Rs)	Distribution of family	
	Number	Per cent
≤ 500	110	36.67
501-1500	176	58.66
1501-2500	14	4.67
Total	300	100.00

The data revealed (Table 11) that the monthly food expenditure of 300 families surveyed varied from Rs 500 to Rs 2500. 36.67 per cent of families were observed to spend below or equal to Rs 500 whereas 58.66 per cent of families spend an amount in the range of Rs 501 to 1500. It was also evident that 4.67 per cent of families spend an amount between Rs 1501 to 2500 for food items.

Total monthly expenditures on non food items

The expenditure incurred on various non food items also reflects another aspect of the quality of the life. Hence relevant expenditure data on non food items were collected from each of the 300 household studied. The expenditure on non food items on a monthly basis is given in Table – 12.

From Table 12 it was evident that of 86.33 per cent of families were spending less than Rs 100 on clothing and the remaining families were found to be spending an amount between Rs 101/- to 200/-.

It was found that 63.00 per cent of families were not spending any money for shelter, since they have their own house. It was also understood that 50.00 per cent of these families had benefited the Housing Welfare Scheme of Thanal, which is a free aid housing program especially for BPL families.57.00 per cent of the families had reported to spend an amount less than Rs 100/- which is meant for repair and patchwork of the house. It was also reported that 18.00 per cent of the families spent an amount between Rs 200/- to 400/- as rent for shelter. They also opined that the rent which they are paying was not affordable to them.

When the amount spent for transportation was taken into account, it was found that minimum expense was Rs 50/- and the maximum Rs 297/-.It was also found that 67.67 per cent of the families were spending less than Rs 100/-, while 25.67 per cent of families were spending an amount between Rs 101/- to 200/- and 6.67 per cent of the families in the range of Rs 201/- to 300/- per month.

It was found that 69.00 per cent of families were not spending any amount for education, since they had only grownup children. 15.00 per cent of families were found to spend below Rs 100/- while, 14.33 per cent were spending an

Table 12. Total monthly expenditure on non-food items

Monthly expenditure (Rs.)		0	100	101-200	201-300	301-400	401-500	>500	Total
Clothing	Number		259	41	-	-	-	-	300
	Percent		86.33	13.67	-	-	-	-	100
Shelter	Number	189	57	-	42	12	-	-	300
	Percent	63.00	19.00	-	14.00	4.00	-	-	100
Transportation	Number	-	203	77	20	-	-	-	300
	Percent		67.67	25.67	6.67			-	100
Education	Number	207	45	43	2			-	300
	Percent	69.00	15.00	14.33	0.67	-	1.00	-	100
Medical	Number	22	42	98	98	8	20	12	300
	Percent	7.33	14.00	32.67	32.67	2.67	6.67	4	100
Electricity	Number	24	245	31	-	-	-	-	300
	Percent	8.00	81.67	10.33	-	-	-	-	100
Fuel	Number	-	300	-	-	-	-	-	300
	Percent	-	100	-	-	-	-	-	100
Entertainment	Number	297	3	-	-	-	-	-	300
	Percent	99.00	1.00	-	-	-	-	-	100
Miscellaneous	Number	-	272	20	8	-	-	-	300
	Percent	-	90.69	6.67	2.67	-	-	-	100
Religious and social function	Number	14	275	11	-	-	-	-	300
	Percent	4.69	91.67	3.67	-	-	-	-	100

amount between Rs 101/- 200/- . It was also observed that 0.67 per cent of them were spending an amount ranging between Rs 201/- to 300/- per month, since their children were studying for post graduate courses.

The expenditure on medical care, including health checkup and purchase of medicine ranged between Rs 45/- to 1250/-.The expenditure incurred on maintenance of health, showed that 7.33 per cent of families had not spend any amount for medical care during the period under report. They were depending on government dispensaries and primary health centers for minor ailments they had. 14.00 per cent were found to spend an amount less than Rs 100/- while 32.67 per cent of each were spending an amount ranging between Rs 201/- to 300/- and 301/- to 401/-. About 2.67 and 6.67 per cent of families were spending an amount between Rs 301/- to 400/- and 401/- to 500/- respectively, while 40 per cent of the families spend an amount greater than Rs 500 per month

The amount spent by 276 families for electricity ranged between Rs 55/- to 200/- while 24 families had no expenditure on this account, since they had no connection.81.67 per cent of families were spending an amount less than Rs 100/- while 10.33 per cent of families spend an amount between Rs 61/- to 200/- per month.

When the expenditure for fuel was taken in to account, all the 300 families were spending an amount less than Rs 100/- for fuel per month which ranged between Rs 50/- and 100/-

Of the families surveyed 99.00 per cent had no expenditure on entertainment while 1.00 per cent of families had spend less than Rs 100/- for entertainment during the period under report. The expenditure incurred for religious and social functions ranged from Rs 50/- to 200/-.It was observed that 4.67 per cent of families had no expense for this purpose while 91.67 per cent spend below Rs 100/- and 3.67 per cent had spend an amount ranging between Rs 101/- to Rs 200/-.

Under the miscellaneous items of expenses, 272 families (90.67 %) were found to spending an amount less than Rs 100/- per month for this purpose, while 20 families (6.67 %) were found to be spend an amount between Rs 101/- to 200/-, were as 8 families (2.67 %) were found to spend an amount ranging from Rs 201/- to 300/-.It was observed from the survey that 31 families (10.33%) spend an amount less than Rs 125/- for the purpose of news paper and magazines, which was included in the miscellaneous items of expenses.

Expenditure on personal habits

Distribution of families with respect to the monthly expenditure on personal habits are presented in Table 13

Table 13 Distribution of families with respect to the monthly expenditure on personal habits

Monthly expenditure (Rs)	Alcoholic drink		Betel chewing, Smoking	
	Number	Per cent	Number	Per cent
0	26	8.67	62	20.67
<100	0	0	133	44.33
101-200	0	0	68	22.67
201-300	0	0	37	12.33
301-400	0	0	0	0
401-500	12	4	0	0
>500	262	87.33	0	0
Total	300	100.00	300	100.00

The data presented in Table-13 showed that 26 families (8.67 %) had no expenses related to alcoholic drinking, while 12 families (2 %) were spending an amount ranging between Rs 401/- to 500/-.It was also observed that 262 families

(87.33 %) were spending an amount more than Rs 500/- per month for this purpose.

Details pertaining to the expenditure related to beta, panmasala chewing, and smoking revealed that 20.67 per cent of the families do not have these habits. The result showed that 44.33 per cent of the families spend an amount less than Rs 100/- for the purpose. The remaining families spend an amount ranging between Rs 101/- to 300/-.

Families with respect to savings and debts

Information related to the saving pattern of the families were collected and it was observed out of the total 300 households surveyed, 65.00 per cent saved less than Rs 100/- per month, and the remaining 35.00 per cent saved about Rs 100/- per month. Table-14 gives the distribution of the families with respect to their nature and type of saving.

Table- 14 Distribution of families with respect to nature of savings

Nature of savings	Distribution of subjects	
	Number	Per cent
Bank	300	100.00
Chit funds	69	23.00
LIC	24	8.00
Post office	30	10.00
Others	15	5.00

It was very amazing to observe the changed phase of the rural households that 100.00 per cent of the families have savings in one form or other. The nature of savings showed that all households are having savings in bank on the account of Self Help Groups. Information collected showed that 23.00 per cent

were having small chittis, which helps them more during emergencies. 8.00 per cent had LIC deposits and 10.00 per cent had post office savings.

Another distressing result noticed from the study was that majority of the families had the habit of borrowing money to maintain their household and hence details with respect to this aspect were collected. Details pertaining to the amount borrowed per month were given in Table 15.

Table 15 Distribution of families with respect to the amount borrowed per month

Amount borrowed (Rs)	Distribution of families	
	Number	Per cent
0	11	3.67
≤100	44	14.67
101-200	58	19.33
201-300	18	6.00
301-400	22	7.33
401-500	46	15.33
>500	101	33.67
Total	300	100.00

The families had borrowed an amount ranged below Rs 100/- to 1, 00,000/- prior to socio economic survey. The data further revealed that 33.65 per cent of families borrowed an amount greater than Rs 500/- and the maximum amount borrowed was up to Rs 1,00000/-.14.67 per cent of the families borrowed an amount less than Rs 100/-. It was also noticed that 3.67 per cent of families did not have the habit of borrowing money. Table 15 presents the need for borrowing money with respect to number of families

Tables 16 Distribution of families according to the need for borrowing money

Reason for borrowing money	Distribution of families		
	Number	Per cent	Rank
Not borrowed	11	03.67	
To meet daily household expenditure	60	20.00	2
Treatment	22	07.33	6
Education	08	02.67	8
Repay debts	89	29.67	1
Food	32	10.67	3
Housing	20	06.67	7
Marriage	26	08.67	5
Other expense	32	10.67	4
Total	300	100.00	

Enquiry on the purpose of borrowing money had brought out an idea that 29.67 per cent borrowed money to repay debt which they borrowed earlier.20.00 per cent of the families borrowed money to meet their daily household expenditure. From the results it was revealed that 10.67 per cent borrowed money to meet their food demands; 10.67 per cent for other expenses, 8.67 per cent for celebrating marriage of their children,7.33 per cent for the treatment of their family members, and 6..67 per cent to meet the housing expenses. Only 2.67 per cent was reported to borrow money for educational purposes of their children. Table 17 represents the distribution of families with respect to source of money borrowed.

Table 17 Distribution of families with respect to source of money borrowed

Source of money borrowed	Distribution of families	
	Number	Per cent
Not borrowed	11	3.67
Friends	85	28.33
Relatives	33	11.00
Neighbours	42	14.00
Financiers	97	32.33
Banks/co operatives	32	10.67
Total	300	100.00

As far as the source of borrowing was concerned, 32.33 per cent reported that they borrowed money from private financiers, 28.33 per cent from friends, 14.00 per cent from neighbours, while only 10.67 per cents of the families utilized the service rendered by banks and co operatives.

Table 18 presents the details about the most important economic problems of the families

Table 18 Distribution of families according to their most important economic problems

Economic problems	Distribution of families	
	Number	Per cent
Lack of permanent employment	300	100.00
High price	294	98.00
Repayment of loans/debt	183	61.00
Lack of male earning members	81	27.00
Medical expenses	68	22.67
Housing	52	17.33
Other expenses	46	15.33

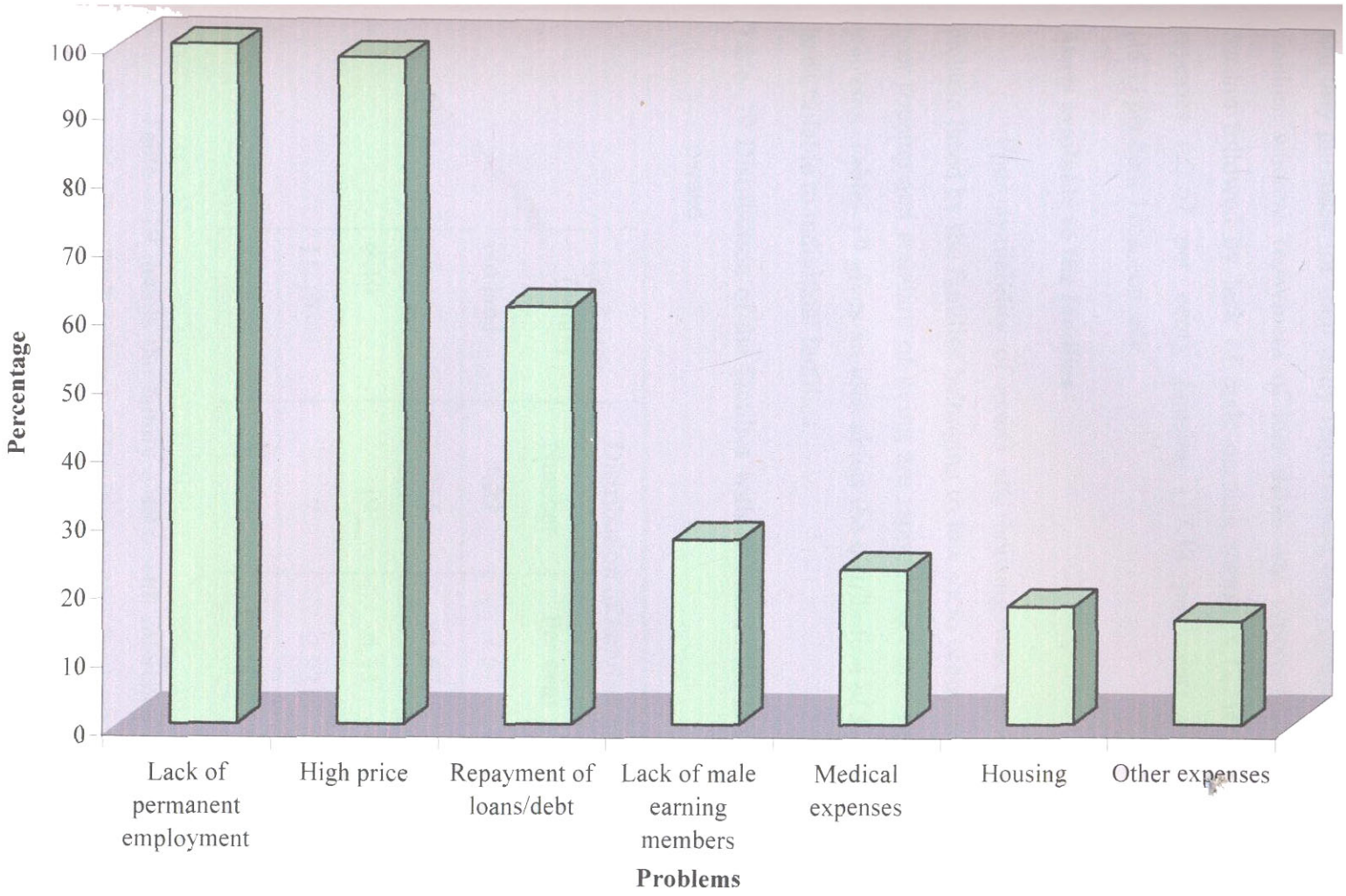

Fig. 2. Distribution of families according to their most important economic problems

Most important economic problem reported by all the respondents (100 per cent) was lack of permanent employment. High price of commodities that they purchase for their daily requirement was reported by 98.00 per cent of families, whereas repayment of loan/debts was reported by 61.00 per cent of families followed by lack of male earning members (27.00 per cent), medical expenses (22.67 per cent), housing (17.33 per cent) and other expenses (15.33 per cent) respectively.

Assets available to the families

Poor availability of assets and housing was reported to be a major problem faced by the families belonging to low socio economic groups. Moreover poor housing and standard of living are reported to cause health and nutritional problems. Table- 19 gives an idea about the distribution of families according to land available to individual families.

Table- 19 Distribution of the families with respect to the area of land (in cents) owned

Land area (cents)	Distribution of families	
	Number	Per cent
No land	23	7.67
<5	251	83.67
6-10	19	6.33
11-15	7	2.33
Total	300	100.00

Table – 19 details the family assets, with reference to land holdings. It was observed that 7.67 per cent of families had no land, whereas 83.67 per cent of families had land up to 5 cents. Only 8.67 per cent of families possessed land between 6 -15 cents.

Distribution of families according to the ownership of house is presented in Table-20.

Table-20 Distribution of families according to the ownership of house

Ownership of house	Distribution of families	
	Number	Per cent
Owned	246	82.00
Rented	42	14.00
Leased	12	4.00
Total	300	100.00

With regard to ownership of house, 82.00 per cent of the families owned a house, whereas 14.00 per cent families were staying in rented houses. It was noted that 4.00 per cent of the families occupied leased houses.

Details pertaining to the nature of the house are given in Table 21

Table 21 Distribution of families with respect to the nature of the house

Particulars of the house		Distribution of families	
		Number	Per cent
Roof	Tiled	117	39.00
	Thatched	30	10.00
	Terraced	109	36.33
	Sheet	44	14.67
Total		300	100.00
Floor	Mud	28	9.33
	Cement	272	90.67
Total		300	100.00
Wall	Mud	12	4.00
	Raw brick	22	7.33
	Brick	80	26.67
	Hollow brick	178	59.33
	Coconut leaves	8	2.67
Total		300	100.00

Table 21 gives an idea about the nature of housing which includes details related to the roof, wall and floor. From the table it is understood that 39.00 per cent of families had tiled roof, whereas 10.00 per cent were having thatched roof. Others 36.33 per cent were living in terraced roof and 14.67 in sheeted roof. Floor was reported to be cemented for 90.67 per cent and was covered with mud for 9.33 per cent. While analyzing the nature of wall, it was reported that 59.33 per cent had their wall built with hollow bricks, 26.67 per cent with bricks and rest (7.33 per cent) with raw bricks, 4.00 per cent with mud and 2.67 per cent with coconut leaves.

Data pertaining to number of rooms is given in Table 22.

Table 22 Distribution of families according to the number of rooms

Number of rooms	Distribution of families	
	Number	Per cent
1	42	14.00
2	204	68.00
3	52	17.33
4	2	0.67
Total	300	100.00

Distribution of families according to the number of rooms in their house revealed that majority of household (68.00 per cent) had 2 rooms, while 17.33 per cent had 3 rooms. The data showed that 14.00 per cent had 1 room, while 2 families (0.67 per cent) had 4 rooms.

Distribution of families based on source of lighting is given in Table 23.

Table 23 Distribution of families based on source of lighting

Lighting source	Distribution of families	
	Number	Per cent
Electricity	276	92.00
Kerosene	24	8.00
Total	300	100.00

Data on the source of lighting revealed that 92.00 per cent of the families used electricity while 8.00 per cent of families used kerosene.

Table 24 Distribution of families based on source of fuel for cooking

Source of fuel	Distribution of families	
	Number	Per cent
Fire wood	149	49.67
Kerosene	68	22.67
Firewood and Kerosene	79	26.33
Saw dust	4	1.33
Total	300	100.00

From Table-24 it was evidenced that 49.67 per cent of the families was found to use fire wood as fuel for cooking food, whereas 26.33 per cent used both fire wood and kerosene. It was also noticed that 22.67 per cent used kerosene and 1.33 per cent used saw dust.

Families based on source of water facilities is given in Table-25

Table 25 Distribution of families based on source of water facilities

Water sources	Distribution of families	
	Number	Per cent
Public well	52	17.33
Public tap	40	13.33
Own pipe	51	17.00
Own well	74	24.67
Neighbours pipe	44	14.67
Neighbours well	39	13.00
Total	300	100.00

As far as source of drinking water was concerned (Table- 25) 24.67 per cent of families had their own well, whereas 17.00 per cent were having tap 17.33 per cent were reported to use public well and 13.33 per cent had public tap. It was further revealed that 14.67 per cent of them take drinking water from neighbours tap and 13.00 per cent from neighbours well.

Availability of sanitary facilities is presented in Table-26

Table 26 Distribution of families with respect to their availability of sanitary facilities.

Sanitary facilities	Distribution of families	
	Number	Per cent
No drainage	300	100.00
No latrine	68	22.67

The availability of latrine and drainage facility were looked into, to asses the sanitary condition of the house and the surroundings. The data showed that 22.67 per cent of families had no latrine facilities. None of the families had drainage facilities. The neatness and sanitation inside and out side the house was very poor.

Utilization of health care facilities

Utilization of health care facilities by the families is presented in Table- 27

Table- 27 Distribution of families utilizing health care facilities

Facilities available	Distribution of families	
	Number	Per cent
Government hospitals	198	66.00
Primary/community health centers	84	28.00
Private hospitals	18	6.00
Total	300	100.00

The first hand information received through the conduct of socio economic survey among the BPL families indicate that 66.00 per cent of families were utilizing government hospitals and 28.00 per cent primary and community health centers. It seems that 6.00 per cent of families utilized private hospitals for better treatment, depending upon the nature of diseases. It was also found that 96.00 per cent of the families were availing the hospital facilities nearer to them.

4.2 RURAL QUALITY INDEX LIFE

From the socio economic data the Physical Quality of Life of families was assessed for computing Rural Quality Life Index (RQLI) using the indicator suggested by (Dhanasekharan, 1991). The thirteen indicators used in computing the RQLI were caste, educational level of the house hold head, occupational category, number of female earners, per capita monthly income, calorie intake per

day per person, protein intake per day per person, annual food expenditure as percentage of income, annual expenditure on clothing per person, type of housing, living area per person and room per person.

The RQLI for each family was computed by sorting each of the indicators by giving weightage of 6, 5, 4, 3, 2,1 and 0.The scores obtained for the individual indicators were summed up to get the total score for a family. The total score obtained by each of the families are presented in annexure

These 300 families were classified into five categories based on the total scores obtained by them as " destitutes ", " very very poor ", " very poor ", " poor" , and "non poor". If they obtained a score of less than 4, 4-14, 15-25, 26-39, and above 40 respectively. The maximum scores calculated for all the indicators were 78. In accordance with this, the house hold under focus in the study were categorized based on their RQLI scores Table 28.

Table 28 Distribution of households based on RQLI

Categories	RQLI range	Distribution of families	
		Number	Per cent
Destitutes	<4	0	0
Very very poor	4-15	20	6.67
Very poor	16-25	67	22.33
Poor	26-39	191	63.67
Non poor	>40	22	7.33
Total		300	100.00

Analysis of the total scores obtained revealed that 63.67 per cent of families had RQLI score in the range 26-39, which were categorized as "poor ". Out of the 300 families surveyed 22.33 per cent scored between 16 to 25 and 6.67 per cent scored between 4 to 15 which were categorized as " very poor " and " very very poor " respectively. It was also observed that 7.33 per cent of families came

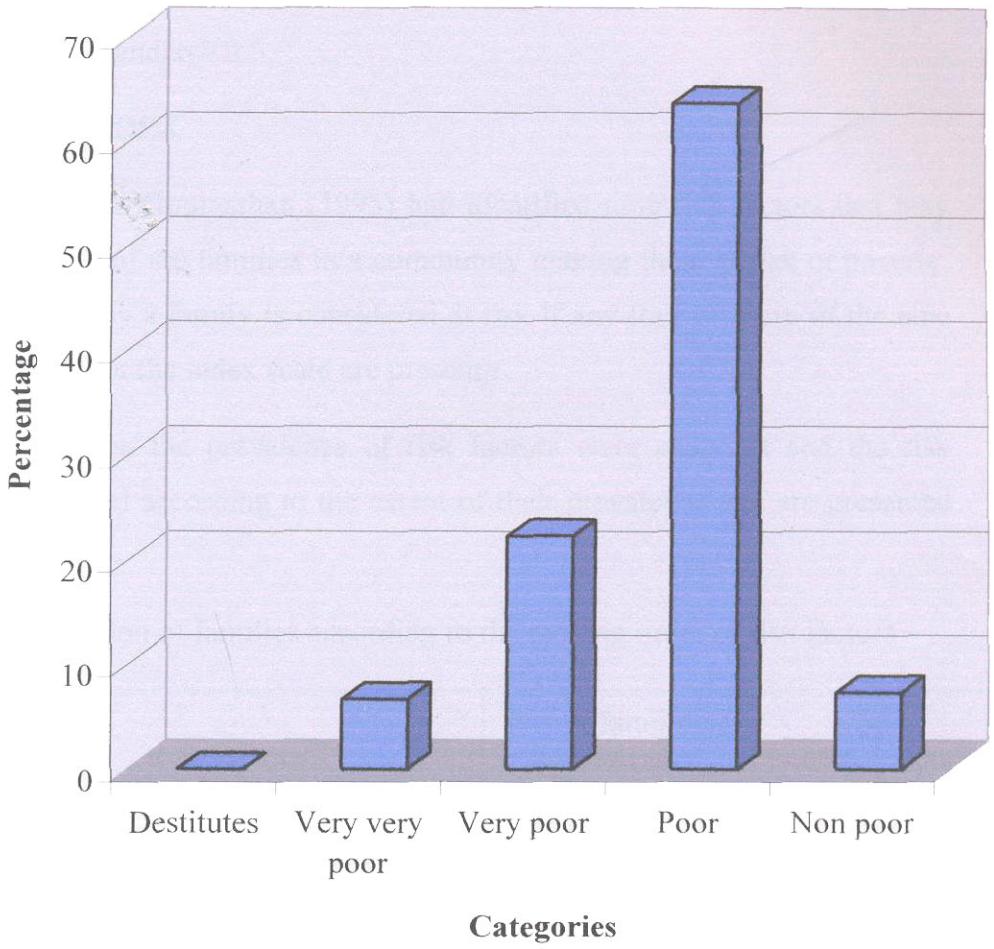

Fig. 3. Distribution of households based on RQLI

under "non poor "which got a score above 40. Analysis of the data revealed that minimum score obtained was 9 whereas maximum was 52. It was also observed that none of the families were classified as "destitutes". Scores obtained for RQLI were given in Appendix-VII.

4.3 POVERTY INDEX

Srilatha and Gopinathan (1995) had identified nine risk factors that may affect the welfare of the families in a community making them at risk of poverty. In the present study a family is considered at risk if any four or more of the nine risk factors listed in the index scale are present.

The data on the prevalence of risk factors were analyzed and the risk factors were ranked according to the extent of their prevalence and are presented in Table- 29

Table 29 Distribution of families according to the ranking order of risk factors

Sl. No	Risk factors	No of families having risk factors	Per cent	Rank
1	Presence of an alcoholic or drug addict or other major crisis	274	91.33	I
2	Family belonging to SC/ST	140	46.67	II
3	Family with one or no adult employed	139	46.33	III
4	Family with no access to safe drinking water	135	45.00	IV
5	Family living in katcha house	102	34.00	V
6	Family consuming only 2 or less meals	88	29.33	VI
7	Family without a household latrine	68	22.67	VII
8	Family with an adult illiterate	45	15.00	VIII
9	Family having children below 5years of age	28	9.33	IX

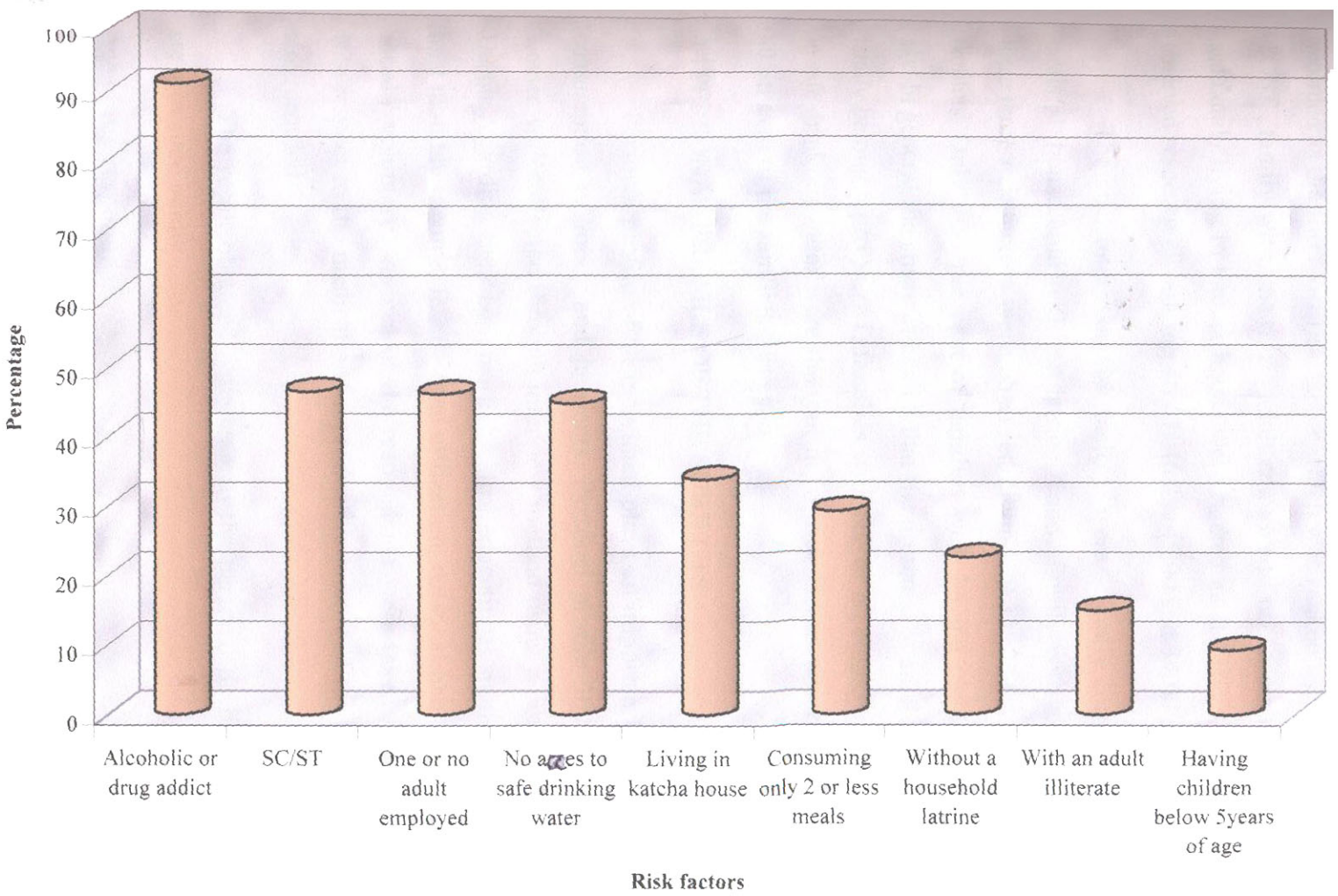

Fig. 4. Distribution of families according to the ranking order of risk factor

The results summarized in Table- 29 showed that 91.33 per cent of families were having "an alcoholic or drug addict or other major crisis "and that was recorded as the foremost risk factor which was ranked as I. Families belonging to SC/ST , family with one or no adult employed , no access to safe drinking water and family living in katcha house were ranked as II , III , IV, and V which were observed respectively among 46.67, 46.33, 45.00 and 34.00 per cent of families

The next important risk factors were " family consuming only 2 or less meals , " house hold with out latrine " and "family with an adult illiterate". All these three risk factors were observed among 29.33, 22.67 and 15.00 per cent of families. Only 9.33 per cent of families were having children below 5 years of age. In general the study indicated that the presence of an alcoholic or drug addict, family belonging to SC/ST, families with one or no employed adult and no access to safe drinking water were the four major risk factors observed among more than 40 per cent of the families surveyed.

4.4 PERSONAL PROFILE OF THE SUBJECTS

Personal profile of an individual plays an important role on the pattern of consumption of foods and nutrients. Personal profile 300 of the middle aged women was collected through interview method using a pre-tested questionnaire. Details regarding their age, marital status, educational status, occupational status, total monthly income, leisure time utilization, personal habits and participation in social / voluntary services of the respondents were taken in to account. Details with respect to the medical and reproductive history of the selected women were also recorded.

The result obtained pertaining to the personal profile of the respondents are presented below

Age of the respondent

Age of the respondents is presented in Table- 30. The data revealed that 40.33 per cent of the subjects were between the age of 51-55 years, 30.67 per cent between 46-50 years while 29.00 percent between the age group 40-45 years.

Table 30 Distribution of subjects based on their age

Age (years)	Distribution of respondents	
	Number	Per cent
40-45	87	29.00
46-50	92	30.67
51-55	121	40.33
Total	300	100.00

Marital status

Marital status of the subjects is given in T*able- 31*

Table-31 Distribution of subjects based on their marital status

Marital status	Distribution of respondents	
	Number	Per cent
Married and living with husband	202	67.33
Widowed	57	19.00
Separated	30	10.00
Divorced	8	2.67
Unmarried	3	1.00
Total	300	100.00

Marital status of the respondents (Table 31) revealed that 99.00 per cent were married; only about 67.33 per cent were living with their spouses now. The data revealed that 19.00 per cent was widows while 2.67 were found to be divorced and 10.00 per cent was found to be separated. It was observed that with

in the age of 55 years, 19.00 per cent of them lost their husband, while separated and divorced constituted 12.67 per cent of the total population.

Education status

Educational level of the subjects is presented in Table- 32

Table-32 Distribution of respondents based on their educational status

Educational level	Distribution of subjects	
	Number	Per cent
Illiterate	25	8.33
Primary level	66	22.00
Secondary level	87	29.67
High school	90	30.00
Pre degree	21	7.00
Diploma / certificate	7	2.33
Graduation	4	1.33
Total	300	100.00

The educational level projected in Table- 32, crystallized the fact that 8.33 per cent of the subjects were illiterate. The data revealed that 30.00, 29.67 and 22.00 per cent of the respondents were found to the educated up to high school, secondary school and primary level respectively. It was also revealed that only 7.00 per cent of them had gone up to pre-degree and 1.33 per cent up to graduation. None of them were reported to be post graduates.

Employment status

Employment status of the subjects are presented in Table- 33

Table-33 Distribution of subjects based on their employment status

Type of employment	Distribution of subjects	
	Number	Per cent
No employment	152	50.67
Private	18	6.00
Petti business	9	3.00
Coir workers	6	2.00
Stone breakers	59	19.67
Agricultural labourers	20	6.67
House maids	15	5.00
Others	21	7.00
Total	300	100.00

Out of the total women population, 50.67 per cent did not have any job, while rest had some sort of small jobs like private employment, petty business, coir workers, stone workers, agricultural labour and as house maids.

Total monthly income

Distribution of the subjects based on their total monthly income is presented in Table- 34.

Table-34 Distribution of subjects based on their total monthly income

Monthly income (Rs)	Distribution of subjects	
	Number	Per cent
No income	148	49.33
<500	97	32.33
501 – 1000	53	17.67
1000-1500	2	0.67
Total	300	100.00

The data related to the distribution of subjects with respect to their total monthly income indicated that, out of the total 300 middle aged women studied 148 (49.33 %) were not having any income. 32.33 per cent of the subjects were earning a monthly income below Rs 500, 17.67 per cent between Rs 501/ - Rs 1000, while 0.67 per cent of the subjects had an income between Rs 1001 to 1500/-.

Freedom to spend money

Distribution of subjects based on their freedom to spend money is presented in Table- 35

Table- 35 Distribution of subjects based on their freedom to spend money

Freedom to spend money	Distribution of subjects	
	Number	Per cent
With the permission of husband	153	51.00
Without the permission of husband /others	105	35.00
No freedom to spend money	42	14.00
Total	300	100.00

Regarding the freedom to spend money, 51.00 per cent of the subjects had to seek permission from their husband to spend money; whereas 35.00 per cent of the subjects were able to spend money without the permission of their husband /others. It was also revealed that 14.00 per cent did not have the freedom to spend money as they wish.

Personal habits of the subjects

Distribution of the subjects based on their personal habits are given in Table- 36

Table- 36 Distribution of subjects on their personal habits

Conventional habits	Distribution of subjects	
	Number	Per cent
Smoking	27	9.00
Beetal chewing	105	35.00
Alcoholism	8	2.67
No habits	160	53.33
Total	300	100.00

As summarized in Table- 36, 53.33 per cent of the women studied had no poor habits, whereas 35.00 per cent of the population had the habit of chewing betel. It was also evident that 9.00 per cent had the habit of smoking while 2.67 per cent had the habit of consuming alcohol.

Participation in Social / Voluntary activities

The distribution of the subjects with respect to their participation in Social/ Voluntary activities is presented in Table -37.

Table -37 Distribution of subjects based on their engagement in Social / Voluntary activities

Social / Voluntary activities	Distribution of subjects	
	Number	Per cent
Not engaged	26	8.67
Engaged as a member	238	79.33
Engaged as a active member	36	12.00
Total	300	100.00

The result showed that 79.33 per cent of the women were engaged in activities as a member, while 12.00 per cent of the women was engaged as active member, It was also noted that out of 300 women, only 26 (8.67 per cent) was not participating in any social programme. Overall data showed that 91.33 per cent of the subjects were engaged in Social / Voluntary activities.

4.5 HEALTH AND REPRODUCTIVE HISTORY

Health history of the sample was collected through interview method and from their medical records. Table-38 details the distribution of respondents with respect to their diseases.

Table-38 Distribution of subjects with respect to their diseases

Diseases	Distribution of subjects	
	No	Per cent
Heart diseases	11	3.67
Hypertension	58	19.33
Diabetes mellitus	60	20.00
Arthritis/Joint pain	156	52.00
Tuberculosis	8	2.67
Jaundice	18	6.00
Gall stone	2	0.67
Kidney diseases	7	2.33
Malaria	1	0.33
Epilepsy	4	1.33
Skin diseases	168	56.00
Thyroid enlargement	18	6.00
Osteoporosis	61	20.33
Asthma	21	7.00
Cancer	12	4.00

Table-38 indicated that, skin diseases (56.00), arthritis (52.00%) and osteoporosis (20.00%) were the major ailments which most of the women suffered. Diabetes mellitus was observed among 20.00 per cent, while hypertension was observed among 19.33 per cent of population. Further analysis of data showed that 3.67 per cent were suffering from heart diseases and 4.00 per cent from different forms of cancers.6.00 per cent of the subjects had suffered from jaundice earlier and 7.00 per cent of the subjects are suffering from asthma, while 6.00 per cent had thyroid enlargement, 2.67 per cent of subjects were affected from tuberculosis and 2.33 per cent had kidney diseases.

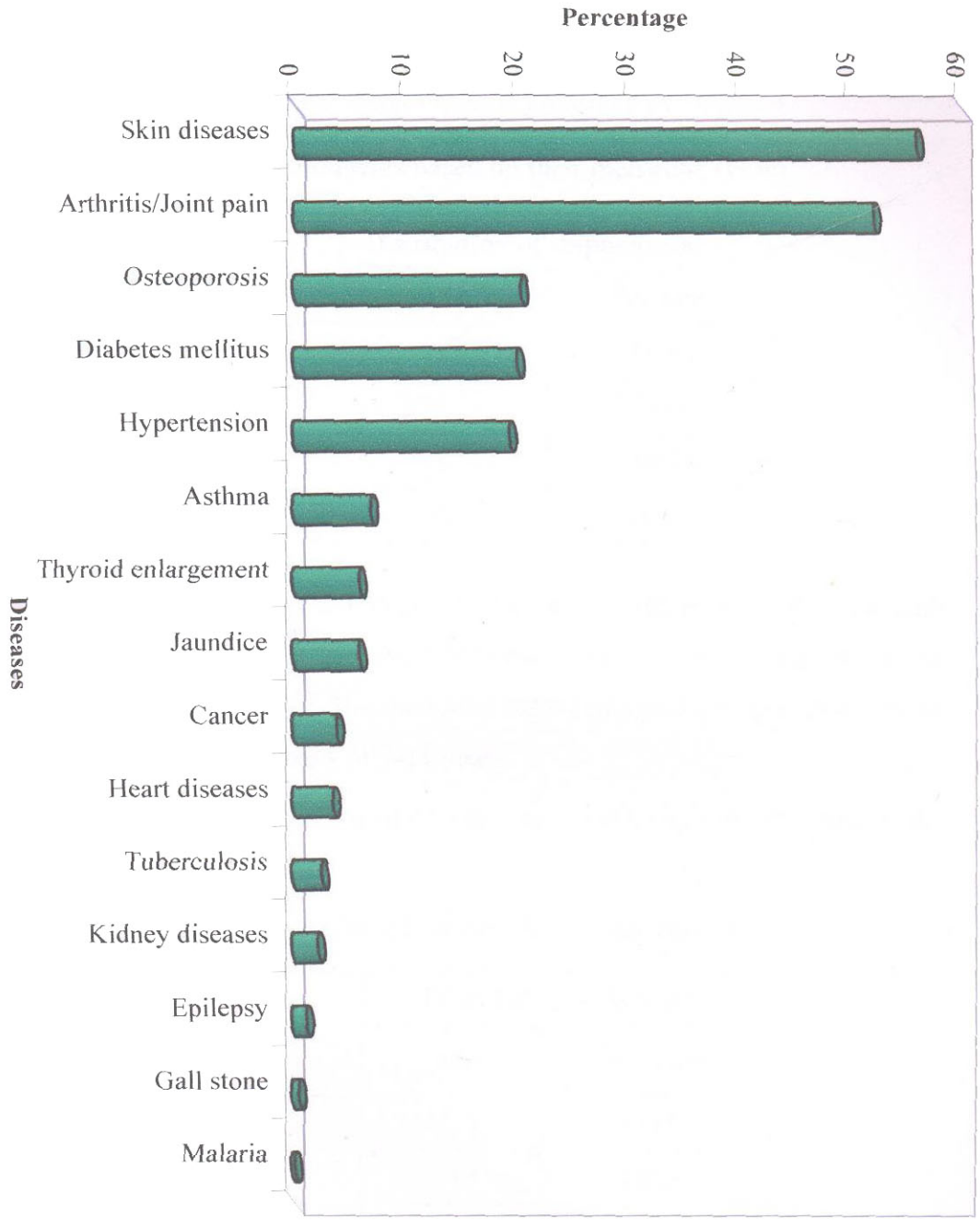

Fig. 5. Distribution of subject wise respect to their diseases

Reproductive history of middle aged women

Reproductive health of 300 middle aged women was collected to know the reproductive history of their past and present years. Distribution of respondents based on the age of menarche was presented in Table-39.

Table- 39 Distribution of respondents based on their menarche (year)

Distribution of age (years)	Distribution of respondents	
	No	Per cent
9 –11	35	11.67
12-15	174	58.00
>15	91	30.33
Total	300	100.00

Age wise distribution of menarche in general revealed that 58.00 per cent of women attained menarche at an age between 12-15 years, whereas 30.33 per cent at an age above 15 years. The data also indicated that 11.67 per cent women attained menarche between ages of 9-11 years.

Distribution of women based on their age at marriage is presented in the *Table-40*

Table 40 Distribution of women based on their age at marriage

Age	Distribution of subjects	
	No	Per cent
Not married	3	1.00
<15	12	4.00
15-18	54	18.00
19-21	198	66.00
22-25	27	9.00
>25	6	2.00
Total	300	100

Table-40 shows that early marriages before the age of 18 years was noted among 22.00 per cent of the subjects while 66.00 per cent married at the age of 19-21 years. 9.00 per cent of women were reported to get married at the age of 22-25 years and 2.00 per cent after the age of 25 years. 1.00 per cent was found unmarried.

Details pertaining to the women based on their age at first conception were presented in Table-41.

Table- 41 Distribution of women based on their age at first conception

Age	Distribution of respondent	
	No	Per cent
No children	9	3.0
<18	61	20.33
18-25	218	72.67
>25 years	12	4.00
Total	300	100.00

Age at first conception is an important factor which determines the health status of women and children. From Table-41 it was observed that majority of women had conceived at the age between 18 and 25 while 20.33 percent had conceived below 18 years. Only 4.00 per cent had conceived above the age of 25 years. 3.00 per cent of women surveyed had no children.

Table –42 shows the distribution if women based on the nature of delivery.

Table- 42 Distribution of women based on nature of delivery

Nature of delivery	Distribution of women	
	No of women	% of total population
Not delivered	9	3.00
Premature delivery	20	6.67
Normal	231	77.00
Ceaserion	27	9.00
Still birth	13	4.33
Total	300	100.00

The data presented in Table-42 showed that 77.00 per cent had normal deliveries, while 9.00 per cent had ceaserion 6.67 per cent of women delivered premature babies, while still birth contributed 4.33 per cent of deliveries.

Details regarding reproductive health problems are presented in Table-43.

Table-43 Distribution of subjects based on the presence of reproductive problems

Reproductive problems	Distribution of subjects	
	No	Per cent
Abortion	53	17.67
Irregular menstruation	82	27.33
Uterus problems	17	5.67
Problems of menopause	171	57.00

Details out lined in Table-43 showed that 57.00 per cent of population had problems related to menopause. 27.33 per cent had irregular menstruation. The

data further revealed that 5.67 per cent had uterus problems and 17.67 per cent had under gone abortion.

4.6 STRESS AND STRAIN

Stress and strain of the 300 middle aged women was assessed with a modified schedule of Townsend (1999). Distribution of respondents based on their stress and strain is given in Table-44.

Table – 44 Distribution of women based on stress and strain

Stress and strain Total score=30	Distributes of subjects	
	No	Per cent
1 -10(normal)	31	10.33
11-20 (moderate)	90	30.00
21-30 (severe)	179	59.67
Total	300	100.00

From Table – 44 it was observed that 59.67 per cent of total population were suffering from severe forms of stress and strain. Moderate stress and strain was found among 30.00 per cent of women, whereas only 10.33 per cent of population were normal having a score below 10. Scores for stress and strain for 300 subjects were given in Appendix VIII.

4.7 NUTRITIONAL PROFILE

Nutritional status reflects the health of a person and is influenced by the quality of food eaten and the ability of the body to utilize these foods to meet its needs. Assessment of nutritional status of the 300 subjects in this study was done by recording the dietary profile, anthropometric profile, clinical status, and estimation of haemoglobin levels.

4.7.1 Dietary Profile

A diet survey was conducted as a primary step to determine the dietary profile of middle aged women. The diet survey revealed information regarding the food habits, food expenditure, frequency of purchase and use of various foods, frequency of cooking and distribution, frequency of meals consumed, daily meal pattern frequency of use of micronutrient rich foods and actual food and. The results obtained from the diet survey are presented below.

Food habits of the respondents

An enquiry on the food habits of the subjects under study revealed that all the 300 subjects (100 per cent) were non-vegetarians. Though they were all branched as non-vegetarians it was observed that fish was the single non vegetarian food they most frequently consumed. They rarely consumed other non-vegetarian food items. Based on the above observation other details pertaining to food purchased and consumption were collected and analyzed.

Monthly food expenditure pattern of the families

In the food consumption survey, an attempt was also made to identify the expenditure incurred by the families on food. The food expenditure for the purchase of different food materials were collected from the subjects, through interview method, and the highlights of the analysis are presented in Table-45.

Rice which is the most important staple cereal of Keralites was purchased by 100 percent of the families and was observed to spend Rs 300 /-month .The expenditure for the purchase of rice and wheat was below Rs 400 /-.

Regarding the purchase of pulses the amount spend was found to be negligible since 100 percent of families spent an amount below Rs 50 /-.

Roots and tubers, the second staple food of Keralites were observed to be purchased by all the house holds and was noticed that an amount below Rs 100 was spent to affect the purchase.

Regarding the purchase of vegetables 14.00 per cent of the families were spending an amount below Rs 50 and 86.00 percent of families spend an amount between Rs 51 to Rs.100 /-. Expenditure on green leafy vegetable was also poor and an amount below Rs 25 /- was spend for the purpose.

The expenditure on oils and fats was found to be below Rs 50 /- by all the 300 families. Coconut oil was mainly used by the families followed by palm oil and sesame oil. Coconut is the major oil seed used by Keralites and in this study all the families were in the habit of buying coconut oil and found to spend an amount below Rs 100 /- for the effect of purchase.

Milk was purchased mainly from milk venders or commercially available milk.96.00 per cent of households were spending an amount below Rs 100 and 4.00 per cent spending between Rs.100 to Rs.150 for the purchase of milk and milk products.

Sugar was used daily by all the house hold and they were spending an amount below Rs 50 /- for the purchase. Jaggery was used occasionally by all the families and amount of Rs 50 /- per month was found to be spending for the purchase of jaggery.

Fish was purchased by all the families, since all were habituated to eat non- vegetarian foods. Among the families 19.00 percent spend an amount below Rs 200 /- per month, whereas 81.00 families spend an amount in between Rs 200-300 to purchase fish.

Information on meat/ egg revealed that 84.33 percent of house holds were spending below Rs 50 /- month, while 15.67 per cent were spending Rs 50-100 / month for the purchase of meat and egg.

Table-45 Monthly food expenditure pattern of families

Items	Expenditure (Rs.)	Number	Percent
Cereals	<300	291	97.00
	301-400	9	3.00
Pulses	<50	300	100.00
Root and Tubers	<50	130	43.33
	51- 100	170	56.67
Vegetables	<50	42	14.00
	51-100	258	86.00
Green leafy vegetables	<25	300	100.00
Oil and fats	<50	300	100.00
Nuts and oil seeds	<50	300	100.00
Milk and Milk products	<100	288	96.00
	100-150	12	4.00
Sugar	<50	300	100.00
Jaggery	<50	300	100.00
Fish	<200	57	19.00
	200-300	243	81.00
Meet/ Egg	<50	253	84.33
	50-100	47	15.67
Fruits	<50	300	100.00
Spices and condiments	<50	300	100.00
Bakery items and processed foods	<50	208	69.33
	50-100	92	30.67
Food out side home	0	98	32.67
	<100	122	40.67
	101- 300	80	26.66

Fruits were purchased for an amount below Rs 50 /- month, by all the households, and the fruits mainly included were banana and grapes which were found to be comparatively cheep. All the families spend approximately Rs 50 on spices.

Purchase of bakery items and processed foods was found to vary widely among the groups and the amount spend was between Rs 50 – 100 /- month.

Expenditure incurred on taking food from outside home was also noted, since this may negatively influence the family food budget. The result revealed that 32.67 per cent of families did not have the habit of taking food from out side whereas 40.67 per cent spend an amount less than Rs 100/- while 26.66 per cent spend an amount between Rs 100-300 for the purpose. Males were having the habit of taking food from outside and this ranged from a cup of tea to break fast, snacks or lunch.

Frequency of purchase of various foods

The distribution of families with respect to the frequency of purchase of various foods is given in Table-46

Data presented in Table-46 revealed that 96.00 per cent of families purchased rice weekly while 4.00 per cent purchased it on daily basis. Regarding the purchase of wheat, 36.00 per cent purchased it weekly once and 56.00per cent monthly and 24.00 per cent occasionally.

It was noted that 56.33 percent of families purchased roots and tubers daily. Regarding the purchase of body building foods, fish was purchased by 97.33 percent of families daily.

Regarding the purchase of protective foods 46.67 percent of families purchased vegetables daily while 65.67 and 9.67 per cent of families do not buy fruits and green leafy vegetables respectively

Fats and oils and spices and condiments were purchased by 94.33 and 92.33 per cent of families weekly.

Health drinks and miscellaneous foods were not purchased by. 99.33 and 70.67 per cent of families respectively.

Table-46 Distribution of the families based on the frequency of purchase of various foods

Food items	Distribution of families											
	Daily		Weekly		Monthly		Occasionally		Never		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Cereals-rice	12	4.00	288	96.00	-	-	-	-	-	-	300	100
Cereals-wheat	-	-	108	36.00	168	56.00	24	8.00	-	-	300	100
Pulses	-	-	18	6.00	87	29.00	162	54.00	33	11.00	300	100
Green leafy vegetables	-	-	46	15.33	89	29.67	136	45.33	29	9.67	300	100
Other vegetables	140	46.67	126	42.00	-	-	34	11.33	-	-	300	100
Roots and tubers	169	56.33	82	27.33	17	5.67	32	10.67	-	-	300	100
Fruits	-	-	11	3.67	22	7.33	70	23.33	197	65.67	300	100
Nuts and oils seeds	98	32.67	118	39.33	53	17.67	37	10.33	-	-	300	100
Milk	206	68.67	5	1.67	9	3.00	68	22.67	12	4.00	300	100
Fats and oils	-	-	283	94.33	10	3.33	7	2.33	-	-	300	100
Sugar and jaggery	-	-	277	92.33	5	1.67	18	6.00	-	-	300	100
Egg	-	-	8	2.67	60	20.00	214	71.33	18	6.00	300	100
Meat	-	-	-	-	76	25.33	206	68.67	18	6.00	300	100
Fish	292	97.33	-	-	3	1.00	5	1.67	-	-	300	100
Spices and condiments	-	-	277	92.33	23	7.67	-	-	-	-	300	100
Health drinks	-	-	-	-	-	-	2	0.67	298	99.33	300	100
Miscellaneous foods	-	-	13	4.33	25	8.33	50	16.67	212	70.67	300	100

Frequency of use of various foods

Frequency of use of various food items among the subjects were assessed by assigning scores ranging from one to seven depending up on frequency of use *viz.*, never, occasionally, once in a month, thrice in a week, twice in a week, once

Table 47. Frequency of use of various food items by the subjects

Food items	Daily		Once in a week		Twice in week		Thrice in a week		Monthly once		Occasionally		Never		Total	
	No	Per cent	No	Per cent	No	Per cent	No	Per cent	No	Per cent	No	Per cent	No	Per cent	No	Per cent
Cereals-rice	300	100	-	-	-	-	-	-	-	-	-	-	-	-	300	100.00
Cereals-wheat	-	-	87	29.00	95	31.67	88	29.33	-	-	30	10.00	--	-	300	100
Pulses	-	-	7	2.33	13	4.33	19	6.33	68	22.67	160	53.33	33	11.00	300	100
Green leafy vegetables	-	-	33	11.00	13	4.33	-	-	89	29.67	136	45.33	29	9.67	300	100
Other vegetables	161	53.67	-	-	37	12.33	68	22.67		-	34	11.33	-	-	300	100
Roots and tubers	175	58.33	13	4.33	9	3.00	83	27.67	--	-	20	6.67	-	-	300	100
Fruits	-	-	10	3.00	-	-	-	-	23	7.67	70	23.33	197	65.67	300	100
Nuts and oil seeds	300	100.00	-	-	-	-	-	-	-	-	-	-	-	-	300	100
Milk	206	68.67	-	-	-	-	-	-	-	-	82	27.33	12	4.00	300	100
Fats and oils	288	96.00	-	-	6	2.00	6	2.00	-	-	-	-	-	-	300	100
Sugar and jaggery	300	100.00	-	-	-	-	-	-	-	-	-	-	-	-	300	100
Egg	-	-	67	22.33	-	-	-	-	34	11.33	181	60.33	18	6.00	300	100
Meat	-	-	-	-	-	-	-	-	77	25.67	205	68.33	18	6.00	300	100
Fish	292	97.33	-	-	-	-	-	-	-	-	3	1.00	5	1.67	300	100
Spices and condiments	300	100.00	-	-	-	-	-	-	-	-	-	-	-	-	300	100
Health drinks	-	-	-	-	-	-	-	-	-	-	2	0.67	298	99.33	300	100
Miscellaneous	-	-	11	3.67	8	2.67	14	4.67	-	-	55	18.33	212	70.67	300	100

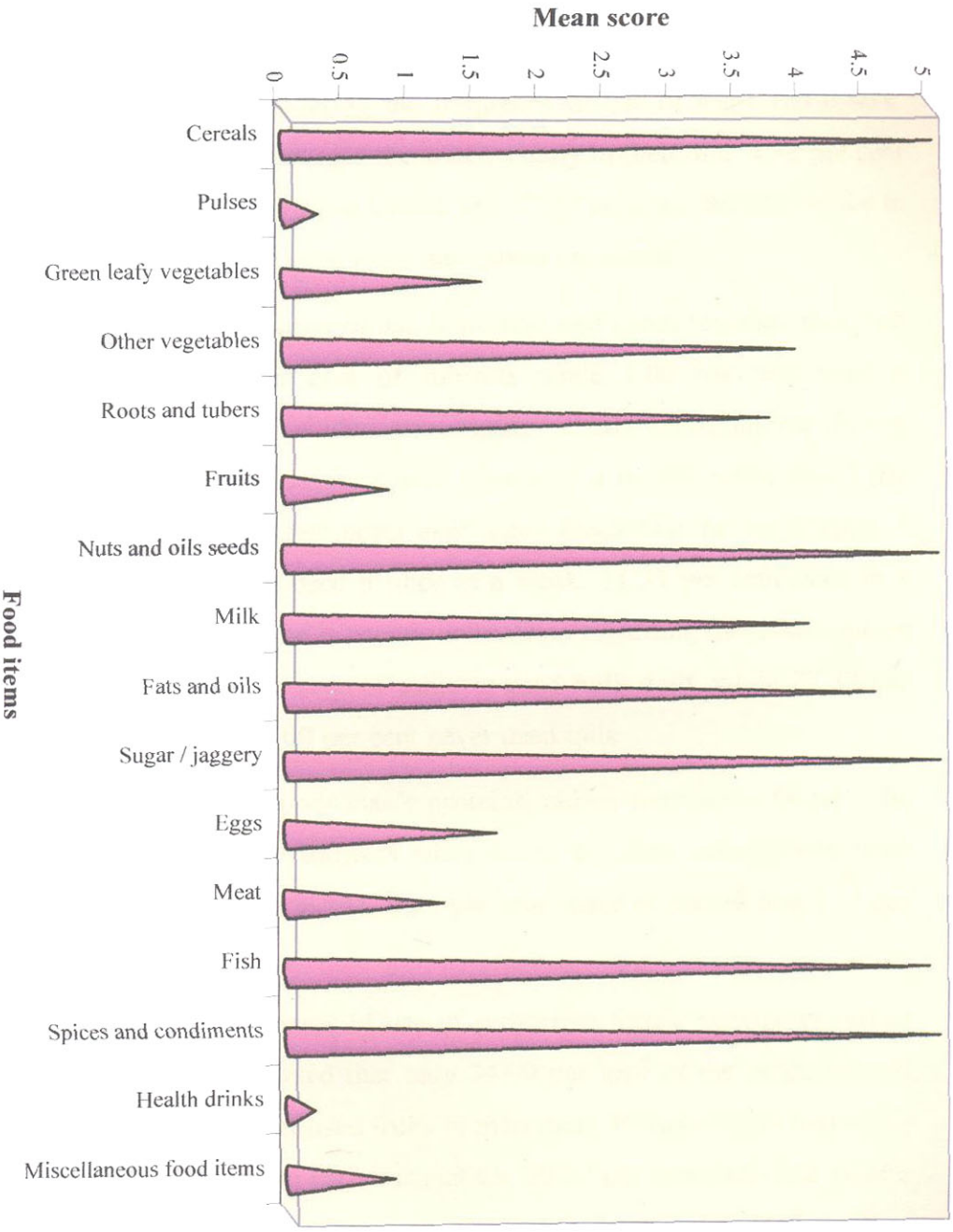

Fig. 6. Distribution of mean frequency score of use of various food items by the subjects

in a week and daily. Data collected based on these scores to determine the frequency of use of different food items in the daily diet was presented in Table 47.

It was noticed that energy rich foods like cereals, nuts and oil seeds (coconut), fats and oils, sugar and jaggery and spices and condiments were used daily by all the subjects. Considering the frequency of use of roots and tubers, 58.33 per cent of the subjects included these items daily in their diet. 4.33 per cent once in a week, 3.00 per cent twice in a week and 27.67 per cent included thrice in a week, while 6.67 per cent included roots and tubers occasionally.

Data regarding the frequency of use of protein rich foods revealed that, fish was used daily by 97.33 per cent of subjects while 1.00 per cent used it occasionally and 1.67 per cent avoided consumption of fish. Consumption of meat revealed that 25.67 percent of subjects used it once in a month, while 68.33 per cent occasionally and 6.00 per cent never used meat. Regarding the use of eggs, it was found that 22.33 per cent used it once in a week; 11.33 per cent once in a month, while 60.33 per cent used it occasionally. Data regarding the consumption of milk showed that 68.67 per cent of subjects used milk daily while 27.33 per cent used it occasionally and 4.00 per cent never used milk.

An enquiry into use of poor man's proteins, pulses were never found to be used by 11.00 per cent of the subjects while 53.33 per cent occasionally used pulses, 22.67 per cent once in a month, 6.33 per cent thrice in a week and 4.33 per cent persons twice in a week.

Data regarding the frequency of use of protective foods, vegetables, green leafy vegetables and fruits reveled that only 34.00 per cent of the subjects used fruits while 65.67 per cent never used fruits in their diets. It was evident that 45.33 per cent occasionally used green leafy vegetables, 29.67 per cent once in a month, 4.33 per cent twice in a week, 11.00 per cent once in a week, while 9.67 per cent never used green leafy vegetables. Consumption of other vegetables was found to be 53.67 per cent daily, while11.33 per cent used them occasionally. It was again found that 12.33 of them used twice in a week, while 22.67 per cent used it thrice in a week.

The use of health drinks was found to be occasional for 0.67 per cents of subjects while 99.33 per cent of the subjects never used this. Miscellaneous items were never used by 70.67 per cent of subjects while 18.33 per cent used it occasionally.

To make the data presented in Table-47 (Food use Frequency) more precise, food used frequency scores were calculated based on the frequency of use of various food items by the subjects. The food articles were classified into most frequently used, less frequently used and least frequently used food, based on the percentage score obtained. The details are presented in Table-48.

Table- 48 Distribution of mean frequency score of use of various food items by the subjects

Food items	Mean scores	Percentage of total scores
Cereals	5.00	100.00
Pulses	0.26	5.20
Green leafy vegetables	1.50	30.00
Other vegetables	3.9	78.00
Roots and tubers	3.70	74.00
Fruits	0.79	15.80
Nuts and oils seeds	5.00	100.00
Milk	4.00	80.00
Fats and oils	4.5	90.00
Sugar / jaggery	5.00	100.00
Eggs	1.6	32.00
Meat	1.2	24.00
Fish	4.92	98.
Spices and condiments	5.00	100.00
Health drinks	0.20	4
Miscellaneous food items	0.81	16.2

As indicated in Table-49 only four food items i.e., cereals, nuts and oilseeds, sugar and jaggery and spices and condiments were found to obtain a mean score of 5. This was followed by fish, fats and oils, milk, other vegetables and roots and tubers, with mean scores of 4.92, 4.5, 4.0, 3.9, and 3.7 respectively. The mean scores obtained for green leafy vegetables was 1.5 and for fruits it was 0.79. The scores obtained for egg, meat and miscellaneous food items were 1.6,1.2, and 0.81 respectively. Pulses recorded a low frequency score of 0.26 while least frequency was for health drinks with a mean score of 0.20.

Table-49 indicates the classification of consumables based on the percentage of food score.

Table-49 Classification of consumables based on food scores

Particulars	Percentage of total scores (%)	Food items
Daily used foods	76-100	Cereals-rice, nuts and oil seeds, sugar and jagerry, spices and condiments, fish, fats and oils, milk and root and tubers
Moderately used foods	51-75	Other vegetables
Less frequently used foods	26-50	Egg, green leafy vegetables
Least frequently used foods	≤ 25	Meat, miscellaneous food items (Bakery items and other commercially prepared food), fruits, pulses and health drinks.

The figures in Table-50 indicated that cereals, especially rice , nuts and oil seeds , sugar and jagerry , spices and condiments , fish , fats and oils, milk and root and tubers were found to be daily used by the subjects, with the percentage of

total scores ranging from 76-100. Meat, miscellaneous food items, fruits, pulses and health drinks were the least frequently used food items with the percentage total scores less than 25. Other vegetables was found to be moderately used with a percentage total score ranging from 51-75,while egg and green leafy vegetables was found to be less frequently used with a percentage of total score ranging between 21-50.

Frequency of cooking meals

Information was collected with respect to number of times the meals were cooked and Table-50 reveals the relevant information.

Table-50 Distribution of the families with respect to the number of times the meals were cooked

No of times the meals were cooked	Distribution of families	
	No	Per cent
Once	198	66.00
Twice	97	32.33
Thrice	5	1.67
Total	300	100.00

Table-50, related to the distribution of families with respect to the number of meals cooked in the house hold indicated that 66.00 percent cooked meals once in a day while 32.33 and 1.67 percent of the population cooked twice and thrice in a day respectively

Frequency of meals consumed

An enquiry into the frequency of meals consumed by the families revealed that majority followed the three meal-a-day-patterns. Out of the 300 families surveyed 212 families (70.67) had the habit of consuming three meals a day,

namely breakfast, lunch and dinner. However there were 88 families (29.33percent) who had the habit of consuming only two meals-a-day

Intra household distribution of food in the family

As indicated in Table - 51 it was observed that 65.33 per cent of families surveyed took meals according to the convenience of the members and none of them followed a specific time schedule. Meal timing varied from person to person may be mainly due to the varying work pattern and schedules followed by the members of the respective families. 18.00 per cent of families were found to serve meals first to male members in the family and to children and other family members later. About 2.67 per cent of families are observed to have a common meal time for all the members of the family when every body was expected to be present. In all the house hold surveyed, no preference was given to vulnerable group particularly pregnant and lactating mothers in the distribution of foods during meals. However majority reported a specific time for dinner between 8 to 10.30 pm.

Table -51 Intra family food distribution pattern of families

Preference given in food distribution	No	Per cent
Male members first followed by children and other members	54	18.00
Male members and children together and then others	42	14.00
Convenience of family members	196	65.33
All members together	8	2.67
Total	300	100.00

Daily meal pattern of the subjects

The daily meal pattern of the subjects were further studied using the dietary-recall method, since it would give information on the food items commonly consumed, as well as the general dietary pattern. Table-52 Reveals the daily meal pattern of the subjects surveyed

Table 52 Distribution of subjects based on their daily meal pattern

Sl no	Type of food	Meal pattern									
		Early morning		Breakfast		Lunch		Evening		Dinner	
		No	%	No	%	No	%	No	%	No	%
1	Black tea	98	32.67	-	-	-	-	88	29.33	-	-
2	Tea	202	67.33	-	-	-	-	142	47.33	-	-
3	Tea with bakery items	-	-	-	-	-	-	28	9.33	-	-
4	Black tea, bakery items	-	-		8.00	-	-	34	11.33	-	-
5	Yesterdays left over food	-	-	195	65.00	-	-	-		-	
6	Cereals, cereals and dhals, coconut preparations with black tea or tea	-	-	24	8.00		-	-	-		
7	Wheat preparations with black tea or tea	-	-	38	12.67		-	-	-	21	7.00
8	Rice, fish, coconut	-	-	-	-	153	51.00	-	-	141	47.00
9	Rice, fish, coconut,tapioca	-	-	-	-	70	23.33	-	-	62	20.67
10	Rice, fish, vegetables,coconut	-	-	-	-	77	25.67	-	-	76	25.33
11	Not taking food	-	-	43	14.33	-	-	8	2.67		-
		300	100	300	100	300	100	300	100	300	100

Daily meal pattern of the subjects as presented in Table-52 revealed that 67.33 percent of subjects had the habit of taking tea and 32.67 percent of the subjects consumed black tea early in the morning. As far as breakfast was concerned 65.00 percent of subjects were found to consume left over foods of the previous night. While 8.00 percent consumed either preparations made from cereals or cereals with dhal, along with coconut incorporated side dish. Wheat preparations with black tea or tea were included in the breakfast of 12.67 percent of the subjects 14.33 percent did not have any breakfast.

The lunch pattern of the subjects indicated that rice, fish curry and tapioca formed the major food consumed by 38.99 percent of subjects while rice, fish curry and vegetable preparation was included by 35.00 per cent of subjects surveyed. The commonly found vegetable preparations were aviyal, thoran (cluster beans, drumstick, banana, amaranth, cabage), pachady, sambar, and thiyal. Rice and fish curry was consumed by 26.67 per cent of families surveyed.

As far as evening tea was concerned 29.33 percent of the subjects had the habit of taking blacktea and 47.33 had tea, while 9.33 and 11.33 percent were observed to take snacks like mixture, pakkavada, banana chips or a similar fried items, along with black tea and tea respectively. The daily dinner pattern of the subjects was same as that of lunch, and the items cooked during lunch is used for dinner also.

Frequency of use of micronutrient rich foods

Data regarding the use of foods rich in micronutrient in the daily diets among the 300 middle aged women were collected and presented in Table – 53.

Table- 53 Frequency of use of micro nutrient rich foods

Food items	**Daily**	**Weekly**	**Occasionally**	**Never**
Cereals				
Rice flakes	-	-	189 (63.00)	111 (37.00)
Wheat	-	270 (90.00)	(10.00)	-
Pulses	-	-	-	-
Green gram	-	21 (7.00)	246 (82.00)	33 (11.00)
Green Peas	-	18 (6.00)	249 (83.00)	33 (11.00)
Bengal gram	-	34 (11.33)	237 (79.00)	29 (9.67)
Cowpea	-	27 (9.00)	240 (80.00)	33 (11.00)
Roots & tubers				
Carrot	-	19 (6.33)	281 (93.67)	
Potato	-	68 (22.67)	184 (61.33)	48 (16.00)
Yam		168 (56.00)	94 (31.33)	38 (12.67)
Sweet potato	-	-	300(100.00)	-
Green leafy Vegetables				
Amaranth	-	27 (9.00)	258 (86.00)	15 (5.00)
Agathi	-	-	32 (10.67)	268 (89.33)
Cabbage	-	89 (29.67)	202 (67.33)	9 (3.00)
Coriander/curry leaves	91 (30.33)	117(39.00)	92 (30.67)	-

Table 53 Continued

Food items	Daily	Weekly	Occasionally	Never
Other vegetables				
Drumstick	-	71 (23.67)	218 (72.67)	11 (3.67)
Beans	-	13 (4.33)	264 (88.00)	23 (7.67)
Snakeguard	-	112 (37.33)	188 (62.67)	-
Ladies finger	-	288 (96.00)	12 (4.00)	-
Fruit				
Banana	-	76 (25.33)	224 (74.67)	-
Jack fruit	-		300 (100.00)	-
Mango			300 (100.00)	
Orange			300 (100.00)	
Papaya			142 (47.33)	158 (52.67)
Dates			98(32.67)	202(67.33)
Nuts and oil seeds				
Ground nuts			300 (100.00)	
Coconut	300 (100.00)			
Egg		67 (22.33)	215 (71.67)	18 (6.00)
Fish	292 (97.33)		3 (1.00)	5 (1.67)
Meat			282 (94.00)	18 (6.00)
Liver				300(100.00)
Milk & milk products	206 (68.67)		82 (27.33)	12 (4.00)

Values in parenthesis indicates percentage

Focusing on the use of cereals, rice flakes was occasionally used by 63.00 per cent of the subjects, while and 37.00 per cent never used these items in their

diets. Wheat was used weekly by 92.00 per cent and occasionally by 8.00 per cent of subjects.

Regarding the use of pulses green gram, green peas and bengal gram and cow pea were used weekly once by only 7.00, 6.00 , 11.33 and 9.00 per cent of population respectively, while these items were used occasionally by 82.00 ,83.00 , 79.00 and 80.00 per cent of population. At the same time 11.00, 11.00, 9.67 and 11.00 per cent of population had never included these items in their diets.

Considering the use of roots and tubers, carrot was used by 6.33 per cent of women weekly once while potato, and yam were used by 22.67, 56.00 per cent of population weekly. Potato was never used by 16.00 per cent of women. Sweet potato was also found to be consumed occasionally by 100.00 per cent of population.

Focusing on the use of green leafy vegetables, it was observed that amaranth was used occasionally by 86.00 per cent of the population, while 9.00 used it weekly once and 5.00 per cent never used amaranth in their diets. Results revealed that drumstick leaf was never used in their diets by 89.33 per cent of the population, while this was used occasionally by 10.67 per cent of women. Agathy leaves are used by 4.67 per cent of women while it was not at all consumed by 93.33 per cent. Considering the frequency of use of cabbage 29.67 per cent used this item weekly once while 67.33 used it occasionally and 9.00 per cent never used this items in their diets. Corriander and curry leaves were used daily by 30.33 per cent of women while 30.67 per cent used it occasionally and 39.00 per cent used it weekly once.

Regarding the use of other vegetables, it was noticed that only 23.67 per cent included drumstick weekly once in their diets, 72.67 per cent used it occasionally, while 3.67 per cent never included drumstick in their menu. Beans was included weekly once by 4.33 per cent and 88.00 per cent include it occasionally, while this item was never used by 7.67 per cent of subjects. It was noticed that snake guard was included weekly once by 37.33 per cent and occasionally by 88.00 per cent. Bitter guard was used occasionally by 60.33 per

cent and 39.67 per cent never, while ladies finger was used by 96.00 per cent weekly once and 4.00 per cent occasionally.

With regard of use of fruits, bananas were used weekly once by 25.33 per cent of women and 74.63 per cent occasionally used it. Jack fruit, mango and orange were found to be used occasionally by 100.00 per cent of women. Papaya and dates were found to be consumed by 47.33 per cent and 32.67 per cent occasionally and 52.67 and 67.33 per cent never used these items in their diets.

Regarding the use of nuts and oil seeds, coconut was used in the diets by 100.00 per cent of women. While ground nuts were consumed occasionally by all.

Regarding the use of animal foods, Fish was daily consumed by 97.33 per cent of women, while meat and eggs were consumed by 94.00 per cent and 71.67 per cent of women occasionally. It was also reported that 6.00, 1.67 and 6.00 per cent of women never consumed eggs, fish and meat respectively. Data regarding the consumption of liver showed that 100.00 per cent never consumed this item. Milk and milk products like curd or butter milk was used daily by 68.67 per cent of women, while 27.33 per cent used it occasionally and 4.00 per cent never used it in their diets.

Actual food intake

The results presented in Table- 54 and 55 gives a composite picture with respect to food and nutrient consumption of middle aged women. Hence it was desirable to see whether the diet consumed by the women were adequate to provide the required food materials and nutrients. The food intake of 300 middle aged women was assessed by conducting a 24-hour recall in order to determine the quantity and quality of food. From the data collected by recall method, the raw equivalent of the food consumed was computed. The nutritive value of foods consumed was computed using the food composition tables of ICMR (1999). The quantity of each food item consumed was compared with quantity specified as per balanced data (ICMR, 1999). Table-54 represents the average food intake of the 300 women.

Table - 54 Average food intakes of the subjects

Food items	RDA (g)	Average quantity of food consumed (g)	Deviation from RDA	% of RDA met
Cereals	350	326	-24.00	93.14
Pulses	50	12.35	-37.65	24.70
Roots and tubers	50	53.38	+3.38	106.76
Other vegetables	75	49.93	-25.07	66.57
Green leafy vegetables	100	14.00	-86.00	14.00
Fruits	60	13.81	-46.19	23.02
Milk and milk products	150	40.00	-110.00	26.67
Meat + fish + egg	90	71.32	-18.68	79.24
Fat and oils	35	8.04	-26.96	22.97
Sugar and jaggery	30	15.24	-14.76	50.80

Among the various food items consumed by the subjects, the intake of cereals was sufficient to meet only 93.14 per cent of RDA. Another calorie supplier, which also supplies protein in Indian dietaries in general are pulses. As far as pulses are concerned, the mean intake was reported to be 12.35g against an RDA of 50g i.e. only 24.7% of RDA.

The consumption of vegetables and fruits which are known to be protective foods were evaluated, and it was noted that other vegetables met only 66.57 per cent of RDA, with an average quantity of 49.93 g against RDA of 75g.

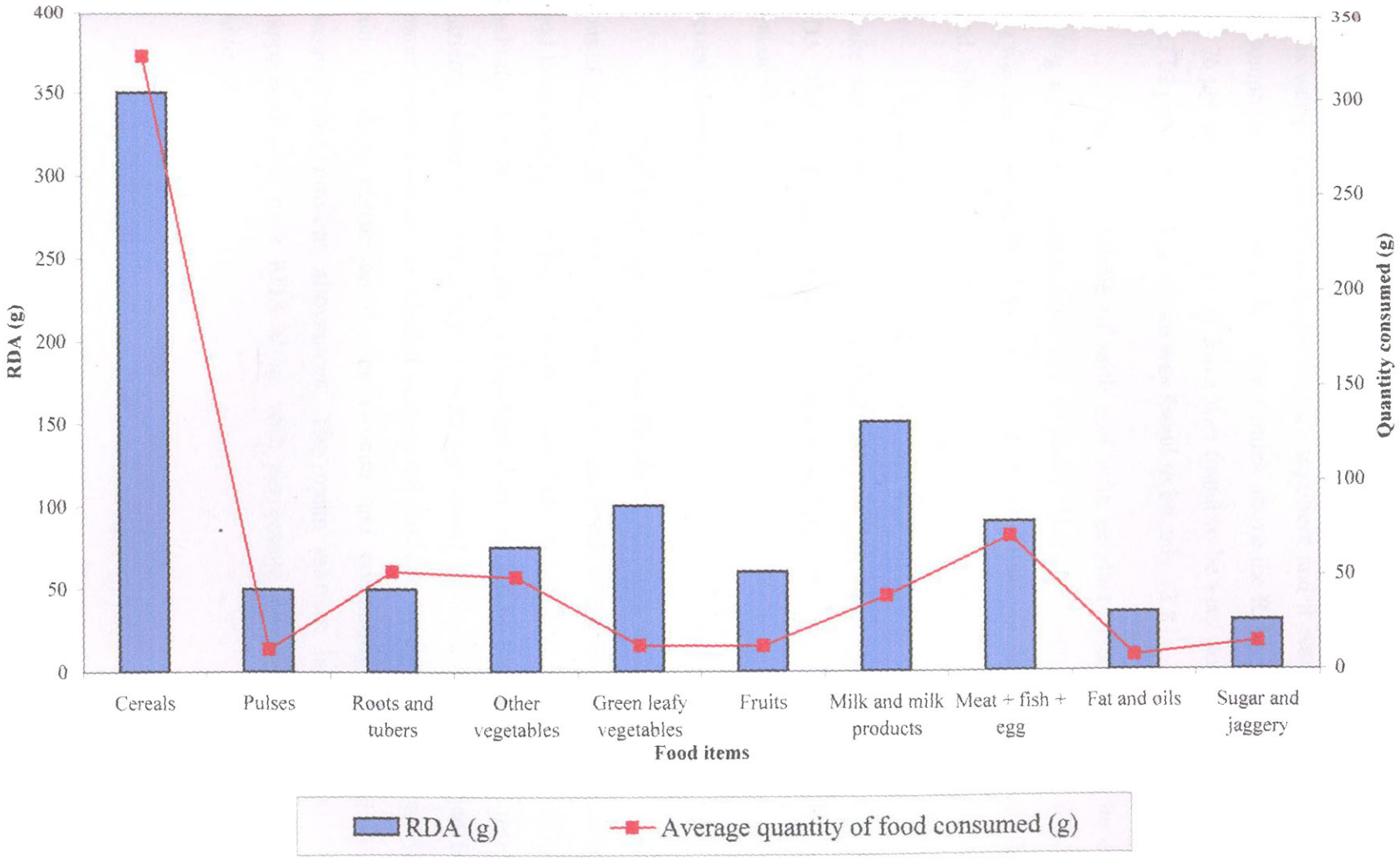

Fig. 7. Average food intake of women

When the intake of green leafy vegetables was taken into account only 14.00 per cent of RDA was met, with a mean intake of 14.00g. Among vegetables, roots and tubers were considered as major energy suppliers and it was seen that the mean consumption of roots and tubers were much above the RDA, with an adequacy of 106.76 per cent. The intake of fruits was found to be very poor with an adequacy of 23.02 per cent and the intake was found to be only 13.81g.

The mean intake of milk and milk products were found to be only 40.00g with a percentage adequacy of 26.67. The consumption of meat, fish and egg was found to be 79.24 per cent of the RDA. However fish was the only flesh food, which majority of them consumed.

As far as the consumption of fats and oils were concerned, the mean intake was found to be 8.04g against RDA of 35g.which met 22.97 per cent of RDA. The percentage adequacy of sugar and jaggery were found to be 50.8 per cent of RDA.

Actual nutrient intake

Apart from satisfying the psychological and social functions, food is consumed directly to cater the physiological needs of the body. This function of food is carried out by the presence of nutrients in the food and its availability to the body. The food consumed is expected to be utilized by the body in the form of nutrients. Hence the adequacy of diets consumed by the 300 middle aged BPL women were evaluated in relation of essential nutrients by computing the nutritive value of diets consumed by the women and comparing it with respective recommended nutrient allowances. The mean nutrient intake of women in comparison with their RDA along with percentage adequacy are presented in Table-55

Table-55 Average nutrient intake of the subjects

Nutrients	RDA	Average intake of nutrients	Deviation from RDA	% of RDA met
Calories (K cal)	2255	2218	-37	98.40
Protein (g)	50	26.04	-23.36	52.08
Calcium (mg)	400	277.00	-123	69.25
Iron (mg)	30	15.28	-14.72	50.93
Vitamin A (µg)	600	304.0	-296	50.67
Vitamin C (mg)	40	18.30	-21.17	45.75
Thiamin (mg)	1.1	0.65	0.45	59.09

As indicated in Table- 55 against the requirement of 2255 Kcal, the subjects were found to secure only 2218 Kcal indicating their energy inadequacy of 37.00 Kcal. The percentage of RDA met was 98.40 per cent.

Protein intake was found to be only 26.04g against an RDA of 50g and was found to meet only 52.00 per cent of their adequacy. Calcium intake was found to be 69.25 per cent of their RDA, which constitutes 277g. The percentage adequacy of iron was found to be only 50.93 per cent, with a deviation of -14.72g from their RDA.

The intake of vitamin-A supplied by beta carotene and retinol through the diet was observed to be only 50.67 per cent of their RDA with a deviation of -296.00g. As the intake of fruits and green leafy vegetables were found to be highly inadequate, vitamin- C consumed was only found to meet 45.75 per cent of RDA. with an average intake of 18.30g.The intake of thiamine was found to be only 59.09 per cent of RDA.

4.7.2 Anthropometric Profile

Anthropometric measurements are considered as the best tool for detecting the various degree of growth retardation among the population. In this study anthropometric parameters *viz.*, height, weight, mid upper arm circumference, hip circumference, and skin fold triceps thickness were recorded. Body mass index and waist hip ratio were also calculated to see the extent of obesity among the middle aged women. Anthropometric measurements of 300 subjects were given in Appendix-IX.

Weight of a person is the most important single anthropometric measurement that could be taken, and the distribution of weight of 300 middle aged women is presented in Table-56.

Table-56 Distribution of women with respect to their weight

Weight (Kg)	Distribution of subjects	
	No	Percent
<40	12	4.00
40-45	78	26.00
46-50	145	48.33
51-55	41	13.67
>55	24	8.00
Total	300	100.00

The data in Table- 56 highlights that 48.33 percent of the population is having body weight ranging from 46-50 Kg whereas 13.67 and 8.00 percent were

having body weight between 51-55 Kg and above 55 Kg respectively .The data also showed that 30.00 per cent of the women had weight below 45 Kg.

Height is also a very important measurement in the assessment of nutritional status. The height of the women was measured and the data is presented in Table-57.

Table-57 Distribution of women with respect to their height

Height (cm)	Distribution of subjects	
	No	Percent
<155	215	71.67
155 (normal)	58	19.33
>155	27	9.00
Total	300	100.00

Table -57 revealed that 71.67 per cent of the subjects were having height below 155 cm, whereas 19.33 percent have a height of 155 cm. It was also noted that 9.00 percent of the women had height above 155 cm.

Body mass index is considered as an useful index for evaluating physical characteristics and risk of degenerative diseases. The BMI of the 300 subjects were computed from their height and weight, based on Garrow's classification and is presented in Table-58

Table-58 Distribution of middle aged women based on BMI

Body mass index	Distribution of women	
	No	Per cent
< 16.0 CED Grade –I	12	4..00
16.1-17.0 CED Grade- II (Moderate)	18	6.00
17.1-18.5 Grade –III (Mild)	22	7.33
18.6-20.0 CED Low Weight (Normal)	77	25.67
20-25 Normal	121	40.33
25.0-30.0 Obese Grade-I	42	14.00
30-40 Obese Grade-II	8	2.67
>40 Obese Grade-III	0	0
Total	300	100.00

BMI of the 300 middle aged BPL women presented in Table – 58 revealed that 40.33 per cent of the women had a normal BMI of 20-25, whereas 25.67 percent, though classified as normal, were found to have lower body weight when compared to reference standards Grade-1 and Grade -2 obesity were detected in 14.00 and 2.67 percent of population . Severe energy deficiency was seen among 4.00 percent of women, whereas none was observed to be having Grade -3 obesity.

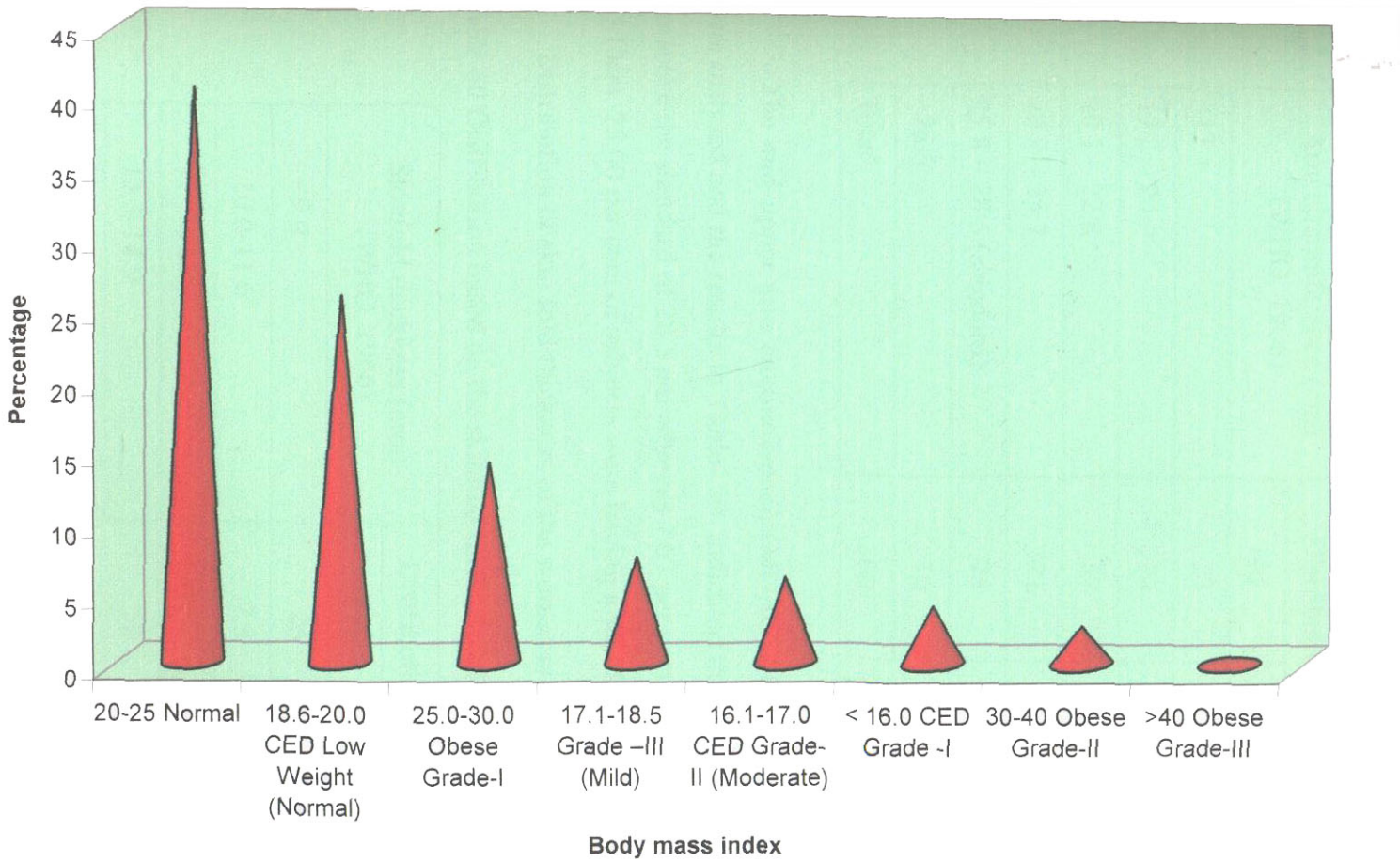

Fig. 8. Distribution of body mass index of middle-aged women

Mid Upper Arm Circumference of women is depicted in Table-59.

Table- 59 Distribution of subjects based on Mid-upper arm circumference

Arm circumference (cm) (WHO, 1966)	Distribution of women	
	No.	Per cent
<17.1	23	7.67
17.2 – 20	28	19.33
20.1 – 22.8	37	12.33
22.9 – 25.7	121	40.33
25.8 – 28.5 (standard)	75	25.00
>28.5	16	5.33
Total	300	100.00

The mid upper arm circumference (MUAC) of the middle aged women were analysed and the results in Table- 59 indicated that 5.33 per cent of women are above the standard of 28.5 cm whereas 7.67 per cent is having a MUAC below 17.10cm. 25.00 per cent of subjects were having a standard value of 28.50 cm.

Distribution of skin fold thickness of the women are presented in Table-60

Table-60 Distribution based on the skinfold thickness of the subjects.

Skinfold thickness (mm) (WHO, 1966)	Distribution of subjects	
	No	Percent
<9.9	26	8.67
10.0-11.6	2.3	7.67
11.7-13.2	137	45.67
13.3-14.9	50	16.67
15.0-16.5(standard)	42	14.00
>16.5	22	7.33
Total	300	100.00

As far as skinfold thickness of the subjects was concerned only 14.00 percent of women were having a normal skinfold thickness between 15.0-16.5 mm. It was also found that 8.67 percent of the women had a skinfold thickness below 9.9mm and 7.33 per cent above 16.5 mm.

Data regarding the distribution of waist circumference is given in Table-61

Table- 61 Distribution of subjects based on their waist circumference

Waist circumference, (cm) (WHO, 1966)	Distribution of women	
	No	Percent
50.80-63.50	69	23.00
66.04-78.74 (normal)	190	63.33
>78.74	41	13.67
Total	300	100.00

Assessment of waist circumference of 300 middle aged women presented in Table- 61 clearly showed that 63.33 per cent of the subjects had waist circumference ranging from 66.04-78.74cm which are considered to be normal. The data also explained that 23.00 per cent are having a value between 50.80-63.50cm, while 13.67 per cent had waist circumference above 78.74 cm.

Table- 62 gives an idea about the hip- circumference of 300 middle aged women.

Table- 62 Distribution of women based on their hip-circumference

Hip circumference (cm) WHO (1966)	Distribution of subjects	
	No	Percent
60.90-73.60	48	16.00
76.20-88.90 (normal)	154	51.33
>88.90	98	32.67
Total	300	100.00

Hip circumference detailed in Table-62 revealed that 32.67 per cent of the subjects are having a hip circumference above 88.9 cm, while 51.33 per cent are having a value from 76.20-88.90 cm. It was also observed that 16.00 percent had values 60.90-73.60 cm.

Data regarding the waist hip ratio are given in Table-63.

Table- 63 Waist – Hip ratio (WHR) of the women

Waist- Hip ratio (Ranges)	Distribution of subjects	
	No of respondents	Percent
< 0.8	0	
0.8-0.85 (normal)	170	56.67
0.86-0.9 (Abdominal obesity)	105	35.00
>0.9	25	8.33
Total	300	100.00

The data gathered from waist and hip circumferences was utilized for deriving waist hip ratio and the details are presented in Table- 63 which showed that none of the subjects were having a waist hip ratio (WHR) below 0.8, whereas 8.33 percent are having a WHR above 0.9. The data showed that 56.67 percent had WHR range of 0.8-0.85 and 35.00 per cent in the range of 0.86-0.90.

Mean anthropometric profile of middle aged BPL women is presented in Table-64.

Table- 64 Mean anthropometric measurements of middle-aged BPL women

Parameter	Mean value	Standard value
Weight (Kg)	47.00	50
Height (Cm)	150.34	155
Body mass index	20.9	20-25
MUAC (Cm)	22.34	28.5
Skinfold triceps (mm)	12.4	16.5
Hip circumference(Cm)	82.65	-
Waist circumference(Cm)	69.44	-
Waist hip ratio	0.84	0 .80

The mean weight of subjects was recorded to be 47.00 Kg and height 150.40cm.

The results on weight and height were used to compute the body Mass Index (BMI) of women, and the mean BMI was 20.9. Mid-Upper Arm (MUAC) was 22.50, while mean skinfold thickness was observed as12.4mm.

The mean waist and hip circumference were found to be 69.44 cm and 82.65 cm respectively and the mean waist hip ratio was 0 .84.

4.7.3 Clinical Status

The clinical examination of the 300 middle aged women was carried out by a medical practitioner. Park (1997) had observed that the ultimate objective of a clinical examination was to assess the levels of health of individuals in relation to the food they consume. The nutritional status of the middle aged women was

assessed through clinical examination, with the help of a clinical examination schedule. The results obtained are presented in Table-65.

Table-65 Distribution of women based on the clinical manifestations

Symptoms observed	Distribution of women	
	No	Per cent
General Appearance		
Good	81	27.00
Fair	126	42.00
Poor	93	31.00
Clinical disorders		
Vitamin- A deficiency –xerosis of conjunctiva, dry and wrinkled skin	36	12.00
Iron deficiency anaemia-dry pale skin, pale look, pale conjunctiva of lower lid, pallor of tongue or nailies.	195	65.00
Iodine deficiency goiter	18	6.00
Vitamin- B complex deficiency – mild angular stomatitis and nasolabial seborrhea , reddish tongue	84	28.00
Vitamin-C deficiency- swollen or spongy bleeding gum	8	8.67
Other health problem		
Dental caries, teeth decay	258	86.00

The clinical examination revealed that, general appearance seems to be poor for 31.00 per cent of population, while 42.00 per cent seems to be fair and 27.00 per cent had a healthy appearance. Clinical disorders of vitamin-A deficiency viz, xerosis of conjunctiva, dry and wrinkled skin were noticed among 12.00 per cent women. Iron deficiency anaemia was found in 65.00 per cent of women. Pale

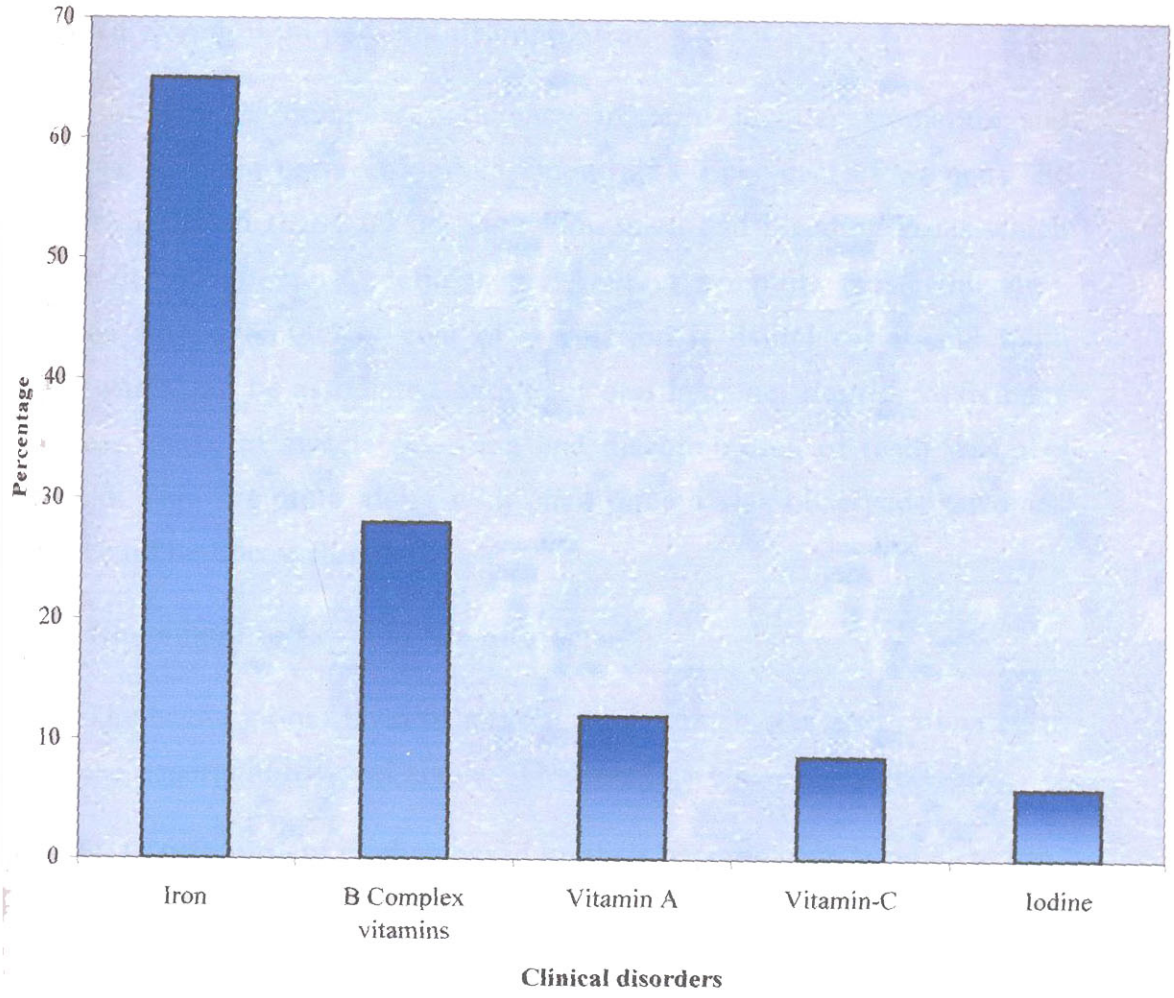

Fig. 9. Distribution of women based on clinical manifestations

conjunctiva of lower lid, pallor of tongue and pale look was commonly observed among these women. Enlargement of thyroid gland, which is noted as a clinical manifestation for goiter was observed among 6.00 per cent of population.

Vitamin- B complex deficiency of mild angular stomatitis and nasolabial seborrhea were observed among 28.00 per cent of women. The data also revealed that 8.00 per cent of women had bleeding gums which may be due to vitamin-C deficiency. Another symptom most commonly observed among 86.00 per cent of population is dental caries and tooth decay, which can be associated with poor oral hygiene, fluoride deficiency or excess intake of sweets. Mottling and discolouration of teeth was also observed. This symptom along with chalky teeth was observed in women which could be due to flurosis.

4.7.4 Haemoglobin Level of the Subjects

The haemoglobin level of middle aged women was also estimated to assess the general nutritional status. The details are given in Table-66.

Table-66 Distribution of women based on their haemoglobin level

Heamoglobin levels g/ dl	Distribution of subjects	
	No	Per cent
< 12 g/dl	198	66.00
12-13	91	30.33
>13	11	3.67
Total	300	100.00

The results presented in Table-66 revealed that 66.00 per cent of the population had haemoglobin value below normal (12 g/dl) which is the cut off value suggested by WHO for diagnosis of anaemia among adults . The data indicates that only 30.33 per cent is having a haemoglobin value between 12-

13g/dl, while 3.67 per cent had values above 13g/dl. Haemoglobin value was obtained for 300 subjects were given in Appendix-X.

4.8 ENERGY BALANCE STUDIES

Human beings need enough energy to be active and healthy. Energy balance of an individual is the level of energy intake from food that will balance energy expenditure, when the individual has a body size, composition and level of physical activity. Energy consumption and utilization has been used as a yard stick to measure undernutrition as well as to assess poverty status. Energy balance of 300 middle aged women was assessed by observing the time utilization pattern, energy intake and expenditure pattern.

Time utilization pattern

In order to assess the workload of middle aged women, the time utilization pattern of the subjects were studied and time spend for each activity per day was recorded. Thus evaluation of time allocation for various activities done by the women in 24 hours were grouped as time spend for doing house hold activities, employment out side the home, leisure time activities and sleep. Average time spent by the subjects for each group of activities is presented in Table-67.

Table- 67 Time utilization pattern of the subjects

Activities	Time spend	
	Minutes (hours)	%of total minutes in a day
House hold activities	480 (8)	33.33
Employment out side home	360 (6)	25.00
Leisure time	180 (3)	12.50
Sleep	420 (7)	29.17
Total	1440 (24)	100.00

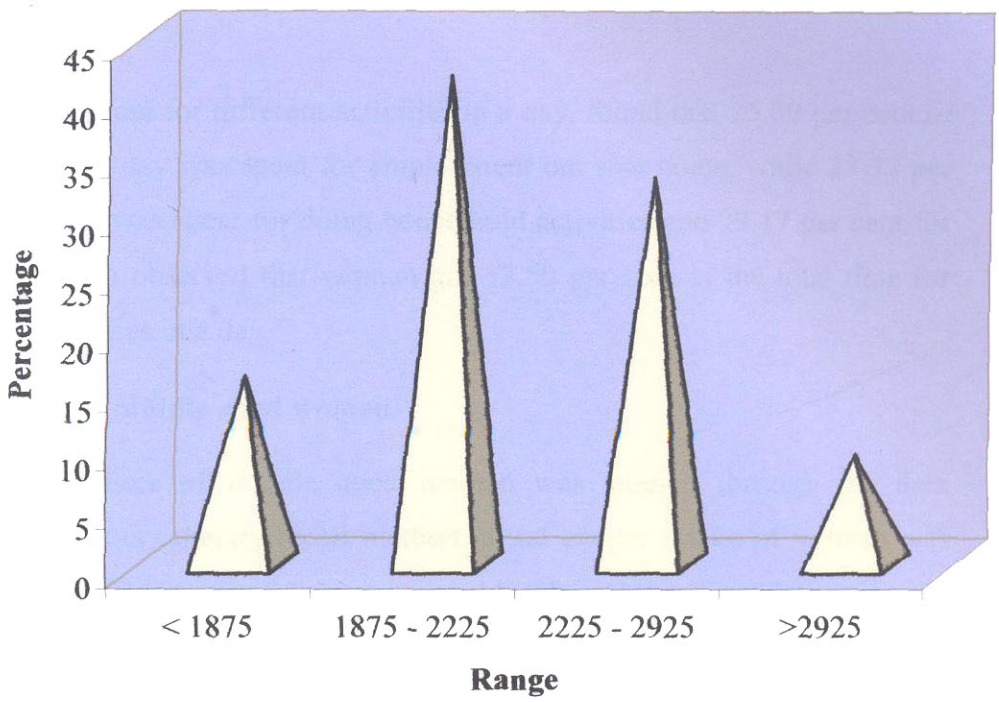

Fig. 10. Distribution of women based on their energy intake

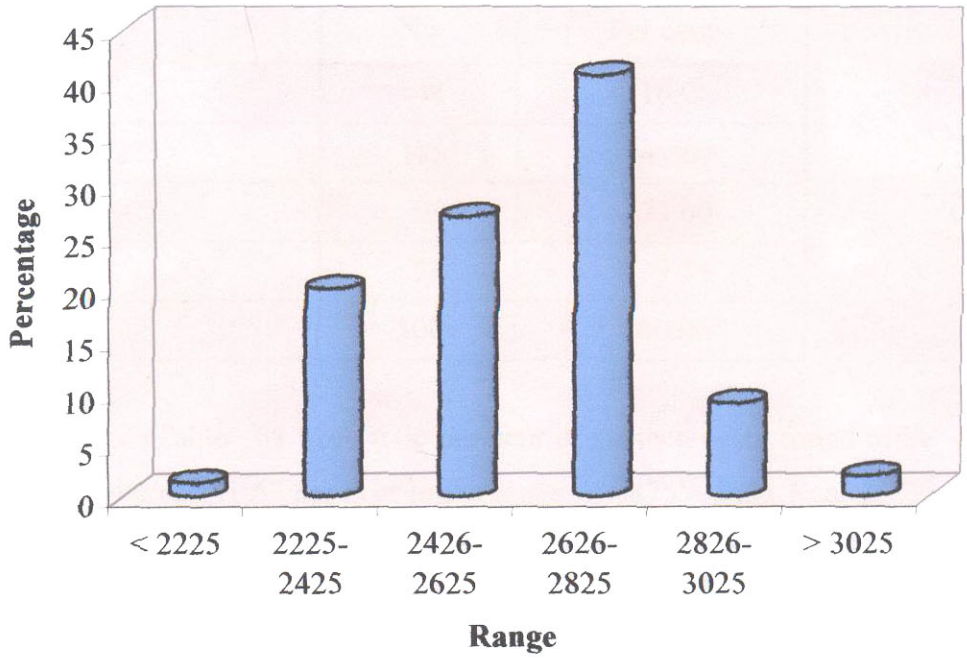

Fig. 11. Distribution of women based on their total energy expenditure (K cal)

The time spent for different activities in a day, found that 25.00 per cent of the total time in a day was spent for employment out side home, while 33.33 per cent of their time was spent for doing house hold activities and 29.17 per cent for sleep. It was also observed that women got 12.50 per cent of the total time for leisure time activities in a day.

Energy intake of middle aged women

Energy intake of middle aged women was studied through the data collected by 24 hours dietary recall method. Total energy intake of women was calculated from the amount of food consumed by the subjects in a day, using the food value table (ICMR, 1994).

Table –68 Distribution of women based on their energy intake

Range	Distribution of subjects	
	No	Per cent
< 1875	48	16.00
1875 – 2225	125	41.67
2225 – 2925	99	33.00
>2925	28	9.33
Total	300	100.00

Energy intake (Table –68) of 16.00 per cent of subjects were found to be below 1875 Kcal, whereas 41.67 per cent in the range of 1875 – 2225 Kcal 33.00 per cent of the subjects consumed energy between 2225 – 2925 K cals, whereas 9.33 per cent consumed energy above 2925 K cals. Results revealed that average energy intake of women were found to be 2218 K cal.

Energy expenditure of women

Energy expenditure for a day was assessed by calculating the total energy utilized for fulfilling all their duties done in a day. For arriving at the energy expenditure, the time spent on a particular activity by the subject was multiplied

with their rate of energy expenditure which was expressed in BMR units as given by ICMR (1994). The distribution of the respondents according to their daily total energy expenditure pattern is given in Table-69.

Table-69 Distribution of women based on their daily total energy expenditure pattern

Total energy expenditure pattern/day (k cal)	Details of subjects	
	No	Per cent
< 2225	4	1.33
2225- 2425	60	20.00
2426- 2625	81	27.00
2626- 2825	122	40.67
2826- 3025	27	9.00
> 3025	6	2.00
Total	300	100.00

The details presented in Table- 69 revealed that 40.67 per cent of the women were found to have a total energy expenditure ranging between 2626-2825 kilo calories per day. It was also observed that 27.00 per cent of the respondents had a total energy expenditure of 2426- 2625 k cals. 20.00 per cent of them had an energy expenditure pattern of 2225- 2425 k cals. It was also observed that 1.33 per cent had expenditure 2225 k cals, while 2.00 per cent had energy expenditure above 3025 k cals. In this study the mean total energy expenditure for 300 women to fullfill all their activities in a day was computed to be 2563 k cals.

Work demands extra energy which varies according to the type of activity and energy expenditure for there activities. Therefore, an attempt was made to compare energy intake of the subjects with their energy expenditure, so as to arrive at their energy balance as well as energy adequacy with respect to intake in comparison with their requirement. The mean energy intake (2218 k cals) when compared with their RDA (2225 k cals) was found to be only 98.40 per cent of

RDA, with a negative balance of 7.00 k cals. When the mean intake (2218 k cals) and mean expenditure (2563 k cals) of energy were compared, a negative energy balance of 345 k cals / day was obtained which shows an energy inadequacy. Energy expenditure of women was given in Appendix-X.

4.9 NUTRITIONAL STATUS INDEX

Nutritional status is an indicator of social well being of a community influenced by factors such as physiological, socio- cultural and psychological and also by thoughts, beliefs and emotions (Otteson *et al.*, 1989).

In the present study the nutritional status index (NSI) of 300 middle aged women was statistically worked out with the help of selected indicators viz height, weight, waist circumference, hip circumference, skin fold thickness, mid upper arm circumference and haemoglobin level. The distribution of the subjects based on the NSI is presented in Table-70.

Table- 70 Distribution of women based on NSI

NSI (levels)	Distribution of subjects	
	No	Per cent
Low (Mean - SE)	183	61.00
Medium (Between mean ±SE)	90	30.00
High (Mean + SE)	27	9.00
Total	300	100.00

Nutritional status of the women ranged from 744.20 to 879.50. Based on this, the women were classified as women with low NSI, medium NSI and high NSI. The respondents whose nutritional status was below mean –SE, between mean ± SE and above mean +SE were respectively classified as low, medium, and high.

The data presented in Table- 74 revealed that mean NSI value of the 300 middle aged women was 811.60 Lowest NSI was observed in 61.00 per cent of

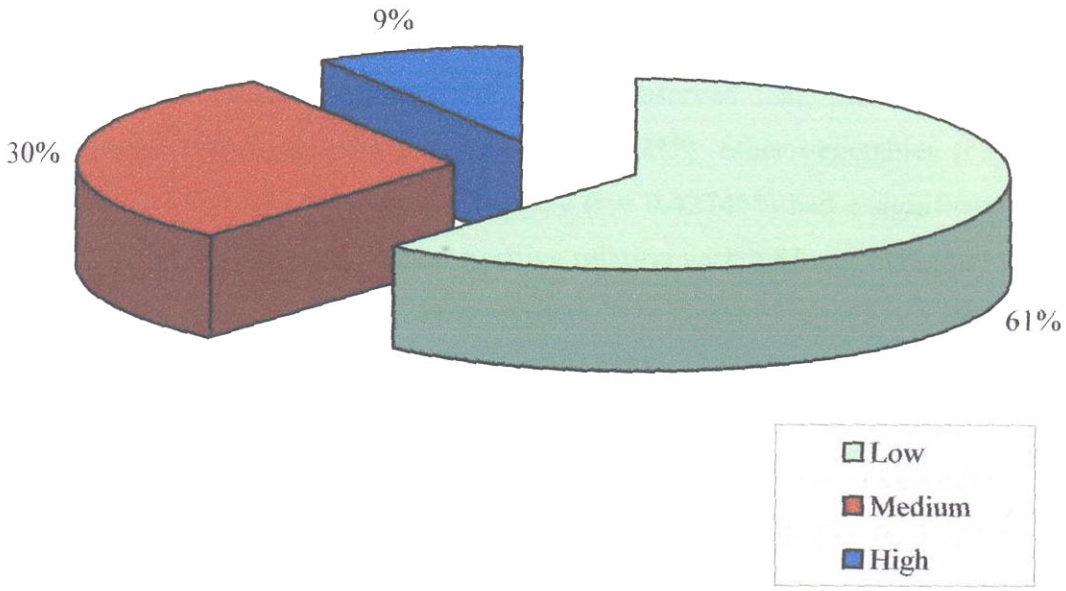

Fig. 12. Distribution of women based on their nutritional status index

women, 30.00 per cent were in medium level category and 9.00 per cent were identified under high level NSI category. The above result with respect to the NSI is indicative of the poor nutritional status of the middle aged women below poverty line. NSI obtained for 300 women were presented in Appendix-X.

Relationship between Nutritional Status Index (NSI) and nutritional variables were worked out. Correlation studies of the data showed that there was a positive correlation between NSI and socio- economic variables.

Among the nutritional variables, intake of some food stuffs and nutrients showed significant relationship with NSI. It was observed that, the intake of cereals (r = 0.3521**), roots and tubers (r = 0.9562**), other vegetables (r = 0.6853**), fish (r =0.7329**), sugar and jaggery (r = 0.4274**) had a significant positive relation with NSI. A significant positive relation with NSI was also found with the intake of calories (r = 0.2986), protein (r = 0.3567**), calcium (r = 0.373**), thiamine (r = 0.4215**), iron (r = 0.3213**) and haemoglobin (r = 0.6392**). Correlation studies of the data showed a highly significant association of NSI with weight (r = 0.7320**), height (r = 0.6853**), waist circumference (r = 0.4567**), hip circumference (r = 0.3947), BMI (r = 0.6584**), WHR (r = 0.7326**) and clinical score (r = 0.8567**).

Correlation of NSI with Rural Quality Life Index gave a highly significant positive correlation (r = 0.9829) but when NSI was related with Poverty Index gave a negative but highly significant correlation (r = -0.7825**). When the NSI was correlated with stress and strain, a negative significant correlation (-0.7726**) was found.

From the macrosample study, it was found that NSI of middle aged women was closely related to anthropometric measurements, stress and strain, and food and nutrient intake. Nutritional status evaluation done in the macrosample of 300 middleaged women had give an indication to the fact that the nutrients and food intake of the subjects were inadequate to meet their daily recommended allowances qualitatively and quantitatively.

Micronutrient deficiency diseases mainly due to deficiency of iron, vitamin A and iodine are of greatest public health concern among all age groups, including middle aged women. Hence a detailed study was conducted on a microsample (n=30) selected from the macrosample to assess the micronutrient profile of women. Based on the Nutritional Status Index developed from the macrosample, 15 women having highest NSI and 15 women with lowest NSI were selected to study the micronutrient profile of the subjects.

4.10 ACTUAL NUTRIENT INTAKE OF THE SUBJECTS (WEIGHMENT METHOD)

Details regarding the meal, the menu, the raw items, cooked food and the quantity of each item actually consumed by these 30 women were recorded individually. Actual amount of nutrients consumed by these women were estimated from the food collected during a single day weighment survey. β-Carotene, iron, iodine, protein, calcium, fiber and vitamin – C in the diet were estimated and their mean values are presented in Table -71

Table- 71 Distribution of women based on their actual mean intake of nutrients

Nutrients	Low NSI	High NSI	t- value	RDA
Dietary β-carotene (μg)	643.88(26.83)	645.86(26.91)	0.35	2400
Iron (mg)	12.68 (42.27)	14.57(48.57)	1.52	30
Iodine (μg)	119.89(79.93)	123.33(82.22)	0.42	150
Calcium (mg)	236.44(59.11)	242.95(60.74)	0.43	400
Protein (g)	24.91(49.82)	25.42(50.84)	0.23	50
Fiber (g)	34.91(87.28)	36.13(90.33)	0.34	40
Vitamin –C (mg)	14.83(37.08)	16.33(40.83)	0.87	40

Values in parenthesis indicates percentage

Table-71 indicates that intake of carotene, iron, iodine, calcium, vitamin-C, fiber and protein were higher for the high index group when compared to the other group, whereas no significant difference was found when compared between the two groups.

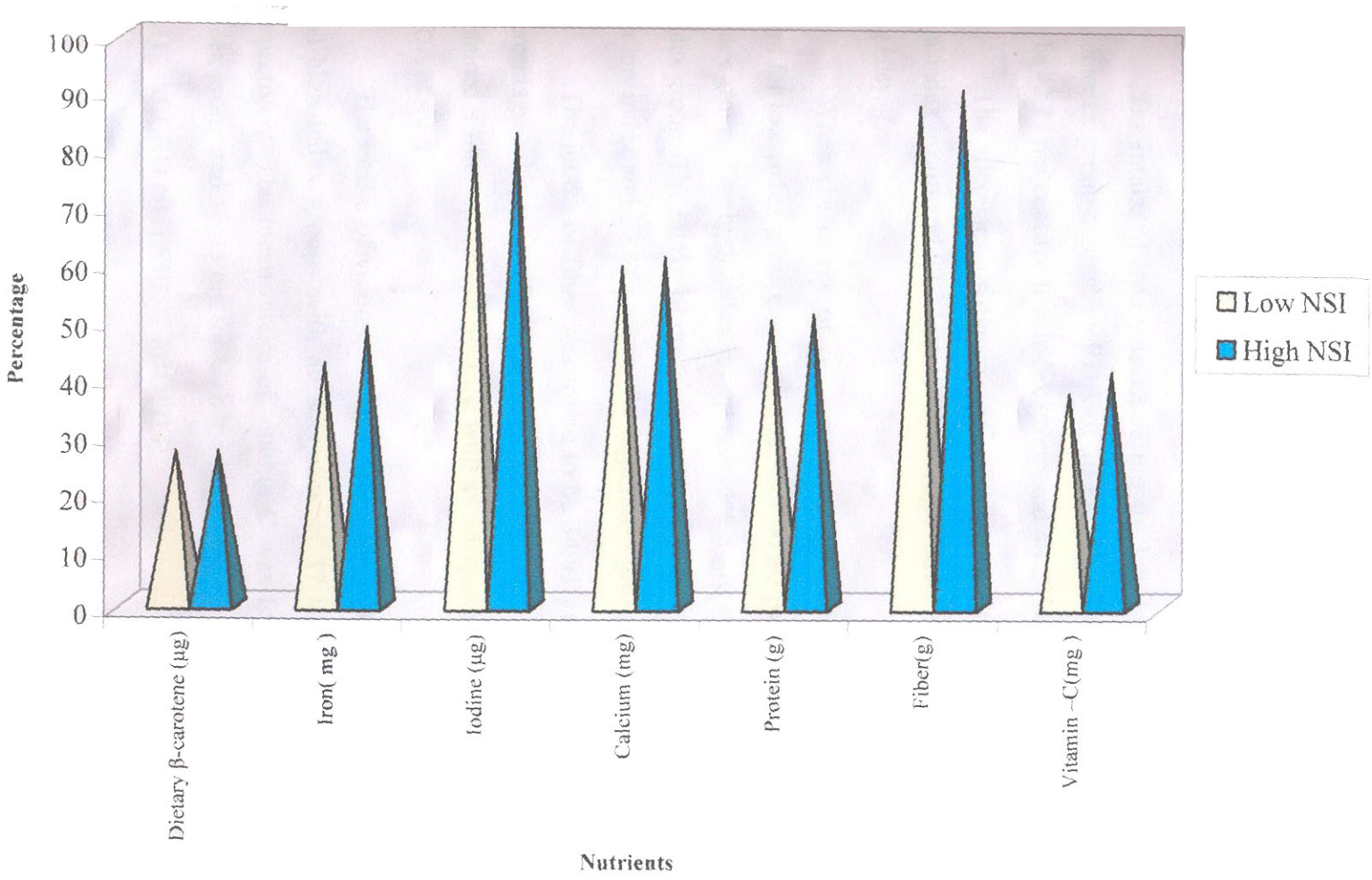

Fig. 13. Actual mean intake of nutrients

The mean daily intake of β- carotene by the low index group was found to be 643.88 μg which met 26.85 per cent of the RDA, while the high index group met 26.91 per cent of the RDA. Percentage of RDA met was below the RDA for both groups.

The intake of iron was 12.68 mg for low index group and 14.57 mg for high index group against an RDA of 30 mg. The adequacy of the diet was found to be 42.27 per cent for low index group and 48.57 per cent for high index group.

The adequacy of dietary iodine was found to be only 79.93 per cent for low index group and 82.22 per cent for high index group against the RDA of 150 μg / day.

When the intake of calcium was considered, an adequacy of 59.11 per cent for low index group, and adequacy of 60.80 per cent was observed for high index group. The high index group recorded a greater intake of calcium than low index group. The intake of protein was also found to meet 49.82 per cent of RDA for low index and 50.84 per cent for high index group.

The intake of fiber was found to be 34.91 gm for low index group with a percentage adequacy of 87.28 per cent. At the same time high index group obtained a fiber content of 36.13 g with an adequacy of 90.33 per cent against an RDA of 40 g.

The intake of vitamin –C was below the RDA of 40 mg for both the low and high index groups with an adequacy of 37.10 per cent and 40.3 per cent respectively. The mean intake of vitamin-C was found to be 14.83 mg for low index group and 16.33 mg for high index group.

4.11 MICRO NUTRIENT PROFILE

WHO (2000) reported that micronutrient deficiencies are prevalent public health problems in many countries, especially developing countries. The micro nutrient deficiencies that are most prevalent in the world are those of vitaminA,iodine and iron, which is mostly developed due to poor dietary intake, coupled with infection and poor dietary bio availability. In this contest micronutrient profile of 30 subjects were assessed by the following method.

A single day food weighment survey was resorted to assess the dietary intake of micronutrients by the subjects. Detailed biochemical investigation were carried out to assess the bioavailable (β- carotene, iron, and iodine) in food and blood drawn from selected 15 middle aged women each, from low and high NSI groups. In case of iodine, urinary iodine was subtracted from dietary iodine to assess the bioavailable serum iodine. The micronutrients profile of the subjects are presented in the following tables

Distribution of subjects based on the β- carotene profile is given in Table-72

Table- 72 Distribution of women based on their β-Carotene status

No	Dietary β carotene(μg/day)		Bio- available Dietary β -carotene(μg/day)		Serum β-carotene(μg/dl)	
	Low NSI	High NSI	Low NSI	High NSI	Low NSI	High NSI
1	623.28	812.79	107.52	139.24	85.64	131.61
2	599.13	631.35	99.98	112.81	54.69	78.25
3	843.38	735.23	138.21	138.00	120.21	126.93
4	727.94	516.35	129.06	94.54	97.96	58.74
5	516.73	625.72	95.37	111.08	56.06	80.13
6	449.40	752.74	89.57	130.21	42.23	123.20
7	989.25	538.91	142.12	97.73	129.61	66.27
8	517.26	800.03	93.91	141.12	52.74	133.71
9	692.78	799.46	102.24	136.00	79.29	139.90
10	715..65	432.18	131.00	88.92	90.43	48.94
11	548.53	572.47	98.13	99.81	63.90	55.53
12	879.71	670.21	138.63	108.04	117.90	81.37
13	513.12	459.26	95.50	86.74	49.00	49.35
14	609.82	893.24	111.92	138.53	81.71	136.00
15	432.14	448.00	82.35	84.31	49.18	53.37
Mean	643.88	645.86	110.37	113.81	78.037	90.89
t	0.35		0.46		1.08	

Table-72 revealed that mean intake of dietary β - carotene for women having low and high NSI were 643.88 μg / day and 645.86 μg / day respectively. The subjects were found to secure only 432.18 μg / -989.25 μg / day indicating that none of them could satisfy their RDA of 2400 μg / day. Total mean intake of dietary β- carotene (644.87 μg / day) showed a percentage adequacy of only 26.87 per cent of RDA. There was statistically no difference between the intakes of dietary β- carotene between the two groups.

Bio- availability of dietary β - carotene of the subjects showed a mean of 110.37 μg /d and 113.81 μg /d for low and high groups respectively. Bio-availability ranged from 82.35 to 142.12 μg / day. There was no significant difference among the groups.

The serum β- carotene levels ranged from 42.23 to 139.90 μg /dl among the sample population, while the normal range 40 – 250 μg /100ml. The result also revealed that there was no significant difference between the low and high groups.

The dietary bioavailability of β- carotene from the diet was 17.38 per cent, while only 13.10 per cent of β- carotene present in the diet was absorbed into the serum.

Respondents based on their iron status are given in Table-73.

Table-73 Distribution of respondents based on their iron status

No	Dietary Iron (mg/day)		Bio available Dietary Iron(mg/day)		Serum Iron (mg/dl)	
	Low	High	Low	High	Low	High
1	12.32	21.41	0.232	0.926	50.78	67.07
2	11.91	13.04	0.568	0.656	48.24	56.42
3	15.25	14.61	0.835	0.948	58.00	60.72
4	13.94	11.19	0.083	0.380	54.21	56.41
5	11.00	13.23	0.027	0.632	49.01	58.27
6	9.00	16.04	0.810	0.08	48.25	62.31
7	18.29	11.73	0.134	0173	62.21	52.10
8	11.82	18.00	0.49	0.34	52.08	65.09
9	13.24	18.84	0.677	0.324	56.72	68.24
10	14.71	9.24	0.923	0.101	58.25	46.72
11	11.05	15.00	0.137	0.5	51.62	56.81
12	16.14	17.24	0.283	0.29	60.74	58.24
13	10.72	9.71	0.867	0.971	47.21	42.04
14	12.53	20.32	0.182	0.709	48.32	70.62
15	8.24	9.01	0.769	0.971	46.51	40.79
Mean	12.68	14.57	0.48	0.53	52.81	57.46
t	1.52		0.94		1.73	

As far as the dietary iron was concerned a mean of 12.68mg/day and 14.57mg/day was found for low and high NSI groups respectively. The mean iron intake, 13.63mg/day was found to be insufficient as indicated by the fact that only 45.43 per cent of the RDA (30 mg/day) was met. The result also showed that there was no significant difference between the intakes of dietary iron among the two groups.

When bioavailability of dietary iron was taken into account, it was found that there was no significant difference between low and high NSI group with mean of 0.48 mg/day to 0.53 mg/day respectively.

As far as the serum iron status of middle aged women was considered the serum iron seems to be in the range of 40.79mg / dl to 70.62 mg/dl, with a mean of 52.81mg/dl for low NSI and 57.46mg/dl for high NSI. The mean serum iron level of the 30 women was recorded to be 55.14 mg/dl which showed an inadequacy, to the normal value of 50-175mg/dl. The data also showed that 30.00 per cent of women are having a serum iron value below 50mg/dl. No significant difference was found between the low and high groups.

Dietary bioavailability of iron from the diet was only 3.7 per cent.

Table-74 gives details about the dietary iodine, Bioavailable dietary iodine and Urinary iodine of middle aged women.

Table- 74 Distribution of respondents based on their iodine status

No	Dietary iodine(µg/day		Urinary iodine (µg/dl)		Bio-available iodine (µg/dl)	
	Low	High	Low	High	Low	High
1	142.78	129.82	135.36	117.21	7.42	12.61
2	148.06	117.79	137.42	108.75	10.64	9.04
3	129.21	86.01	120.20	78.63	9.01	7.38
4	94.24	142.52	90.73	132.74	3.51	9.78
5	122.13	130.96	108.41	122.31	13.72	8.65
6	141.42	107.41	130.94	96.48	10.48	10.93
7	110.91	156.21	104.35	142.92	6.56	13.29
8	119.40	128.08	111.69	116.61	7.71	11.47
9	90.72	134.7	85.05	122.83	5.67	11.87
10	75.51	97.17	67.76	92.41	7.75	4.76
11	132.72	83.93	121.21	75.08	11.51	8.85
12	89.63	133.71	79.59	121.72	10.04	11.99
13	152.84	124.49	146.48	115.63	6.36	8.86
14	120.39	144.86	113.42	133.94	6.97	10.92
15	128.41	130.23	117.63	123.73	10.78	6.5
Mean	119.89	123.33	111.35	113.40	8.54	9.79
t	0.42		0.26		1.36	

The dietary iodine content was found to range from 75.51 to 156.20 μg / day with a mean value of 119.89 μg/day for low and 123.33 μg/day for high NSI. How ever none was found to be having a dietary iodine between 50-75 μg/ day, which was considered to be minimum (50.00μg / day -75.00μg / day). The total mean intake of iodine was found to be 121.61 μg / day. Only one woman was found to have an iodine intake above 150 μg / day, which is considered as safe allowance. No significant difference was found between the intakes of iodine between the groups.

Urinary iodine was found to range from 67.76 μg / L to 146.48 μg / L , with a mean value of 111.35 μg / L for low index group and 113.40 μg / L for high index group. No significant difference was found between the two groups, however a total mean value of 112.38 μg /L of iodine was found against a normal urinary iodine output of 100 μg/ L However, 26.67 per cent of the subject was found to have mild urinary iodine deficiency with an urinary iodine value between 50.00- 99.90 μ g/ L.

Bio-available iodine was estimated by subtracting total urinary iodine/ day from the total dietary iodine/ day. The data revealed that mean availability of 8.54 μg/ dl was found for low NSI group and 9.79 μg/ dl for high NSI category. A total mean value of 9.17 μg /dl was found against a normal serum iodine value of 8-15 μg /dl. However, 36.67 per cent of women were having a serum iodine valu below 8 μ g / dl

The bioavailability of iodine in serum was only 7.54 per cent of the total dietary iodine content.

Correlation studies carried out among NSI group revealed a high significant positive correlation of serum β- carotene with dietary β-carotene (r =0.9652), and bio available β-carotene (r =0.9566). A highly significant positive correlation was also found with serum iron to dietary iron (r =0.9150), bioavailable food iron (r =0.8905), dietary β- carotene (r = 0.9157), bio available dietary β-carotene (r =0.8623) and serum β- carotene (r =0.8739).

Urinary iodine was correlated with dietary β-carotene, serum β-carotene, dietary iron, bio available dietary iron at 5 % level of significance and serum iron and dietary iodine at 1 % level of significance.

No correlation was found between protein and β-carotene, iron and iodine. The correlation studies also showed that there existed relationship between of calcium with dietary iodine (r =0.5758), serum iodine (r = 0.5812), and urinary iodine (r = 0.5402).

A significant correlation was found between dietary vitamin – C and dietary β-carotene (r =0.5657), bio available dietary β-carotene (r = 0.5321), serum β-carotene (r = 0.6326), dietary iron (r = 0.6268) at 5 % level of significance.

The haemoglobin level of the subjects was found to be positively correlated with the serum iron and serum β – carotene at 5% level of significance.

Correlation studies carried out among low NSI groups also revealed a significant correlation of serum β carotene to dietary β carotene (r = 0.9652), and bio available dietary β carotene (r = 0.9566).

Serum iron was also significantly correlated with dietary β carotene (r = 0.9157) bio available dietary β carotene (r = 0.8623) serum β carotene (r = 0.8739) dietary iron (r = 0.9150) and bio available dietary iron (r = 8905).

Dietary calcium was significantly correlated with dietary iodine (r = 0.5758) serum iodine (r = 0.5812) and urinary iodine (r = 0.5272) at 5 % level of significance. The intake of vitamin- C was found significantly correlated to serum iron (r = 0.5186).

Discussion

5. DISCUSSION

The results of the present study entitled "Nutritional profile of middle aged women of Below Poverty Line (BPL) families with special reference to micronutrients" are discussed under the following heads.

5.1 Socio-economic and demographic profile of the macro sample.

5.2 *Rural quality life index*

5.3 Poverty index

5.4 Personal profile

5.5 Health and reproductive history.

5.6 Stress and strain

5.7 Nutritional profile

5.7.1 *Dietary profile*

5.7.2 Anthropometric profile

5.7.3 *Clinical status*

5.7.4 Haemoglobin level

5.8 Energy balance studies.

5.9 Nutritional status index of the macro samples.

5.10 Actual food intake of micro samples (weighment method)

5.11 Micronutrient profile

5.1 SOCIO-ECONOMIC AND DEMOGRAPHIC PROFILE OF MACRO SAMPLES

People living in the rural areas are not able to lead a life worthy of human beings due to poverty and their health condition were the result of the pernicious combination of several socio-economic factors like unemployment, lack of materiai advancement, poor housing, poor sanitation, malnutrition, social apathy,

absence of will power and initiative to change for the better (Rao, 1991). Economic and social conditions are reported to affect the nutritional status of an individual. A clear cut conceptualization is a pre-requisite for notional estimation of the incidence of socio economic situation of the population and to formulate and implement appropriate programmes for the appreciation and eradication of the micronutrient problems identified among women. With this aim, socio economic and demographic profile of 300 middle aged women from Below Poverty Line (BPL) families was ascertained.

Parameters studied were religion, caste, type and size of family, age and sex of family members, family educational and employment status, family income and expenditure pattern, nature of assets, economic liabilities and savings. The results obtained from this study are discussed below.

The religion wise break up of the respondents was assessed, since it has been observed by Arora (1991) that religion plays a dominant role in the process of socialization and it maintains the stability of the social system and social relation ships. In the present study, a sizable majority of the subjects under focus (82.00 per cent) belonged to Hindu community while, 15.00 per cent were Christians and the rest 3.00 per cent were Muslims. This is in accordance with the demographic profile of Thiruvananthapuram district. Kerala Statistical Institute Report (2001) stating that Thiruvananthapuram district has a majority of population who follow Hindu religion. The caste system is reported to be mainly responsible for perpetuating poverty in rural areas. The caste wise analysis showed that 45.67 percent belonged to scheduled caste communities. As per the survey report from Economic Review (2003.a) Kerala has nearly 17.23 lakh families below poverty line where 19% are scheduled caste families, 3% scheduled tribe families and other 78% belong to other categories. The caste based demographic analysis brought out the fact that among BPL families back ward caste and scheduled caste dominated over other categories.

Type of family and family size has an important bearing on the dietary habits of the subjects. Nuclear type families were found to be more popular in the

areas surveyed. This reveals the recent social trend universally observed the fading of joint family system. It might be an attributed fact that modern concept of nuclear family has gained much momentum in rural areas. Predominance of nuclear type families among those residing in Thiruvananthapuram has been also reported by (Ranganathan, 1996). She has reported that per capita income, per capita availability of food and other resources were higher in nuclear families than the joint families. When the average number of members in a family was computed from the total population, it was found to be 4.46 people who show a positive indicator of small family norm. This may be due to the nuclear family system, due to higher female literacy rate and exposure to information through mass media. The above fact in the present study is in accordance with the findings of Boora *et al.* (1999). This small family norm has a great social significance, since it has a direct influence on the per capita availability of income, as well as food which in turn have a direct and favourable impact on the nutritional status of women.

When the demographic profile of the families were analyzed, it was found that population of adults contributed 59.4 per cent, while child population was low when compared to adults, and elderly contributed 14.36 per cent. A similar trend was reported by the Kerala Statistical Institute (2001) in their survey, where they observed a decrease in the per cent of population in the younger generation and an increase in the percentage of 60+ populations in Kerala. Park and Park (1997) have also reported that the demographic profile of India is fast changing and it is characterized by adult population forming 60 per cent and young population forming 40 per cent.

It is interesting to note that the families studied have comparatively more number of females than males. The ratio between male and female in the present study is 1000:1083. This follows the general sex ratio of Kerala, or of Thiruvananthapuram district. According to census figures, there are more females than males. Kerala is the only state in India where the females out number the males in population with a sex ratio of 1000: 1058 (Economic Review 2003.c)

Education is an important indicator for development and especially female literacy is said to hold the key to a generation of full genetic potentials pertaining to health and nutrition. Female literacy is also indicative of better nutritional status. The finding shows that educational status of females is increasing, whereas that of males is decreasing. The finding is in accordance with the views that percentage of women in higher education is increasing in Kerala (Economic Review, 2003.b). Family educational status also shows that present generation is better educated than the older generation.

Employment is a set of activities centered on an economic role and is usually associated with earning a living, which is an important factor, defining a person's prestige, class, position and style of life. Employment status of the population shows that 28.40 per cent of male and 69.60 per cent of females were unemployed. A peculiar feature of Kerala's unemployment situation is that women out number men in seeking employment through employment exchanges which is reflected in all the 14 districts in Kerala. Economic Review (2003.b) has pointed out that unemployment in rural areas was worse contributing 11.6 per cent. The data reveals that among the employed members males dominated the females. Increased number of male bread winners would inturn increase the purchasing power of the families leading to better nutritional status. But during the survey, majority of the women reported that though their men were employed, a large segment of the income they earned was not being utilized for the benefit of other members in the family especially for the children and women. It was reported that men spend major portion of their daily wages on liquor, cigarettes, entertainment and to satisfy their petty personal desires. Because of the above trend which was prevalent among the BPL men, it can be inferred that the women played central role in home management and this pivotal role would lead to conflict between the women's economic roles and their own nutritional needs, with the latter being sacrificed.

Distribution of families with respect to number of persons employed per house revealed that 20.00 per cent of families are having only one employed

member whereas the rest is having more than one employed member. Increase in number of breadwinners in a family elevates the socio economic and nutritional status of the family members. Among the people living below poverty line, the primary source of income would be from their employment. Among the population only 2.89 per cent got 26-30 days of employment in a month. The gravity of the problem of underemployment could clear by understood from the fact that majority are getting employment below 25 days. Food access depends on access to income and regular employment. Thus non-availability of work aggravates the problem of poverty among BPL families. It was also revealed that during some seasons they hardly had any employment and which will create absolute poverty in the households.

According to Arora (1991) income is an important indicator of the social and economic status of an individual. Low income affects the purchasing power and this inturn affects their food security by limiting food choices and thereby leading to malnutrition. In the present study majority of BPL members were occupied as carpenters, labourers, farmers and or were doing petty jobs earning low wages on a daily basis. Still it could be noted that 26.67 per cent of families earned an income between Rs.501/- to Rs.1000/- per month and 63.00 per cent between Rs.1001 – Rs.2000/- . On the other side of income spectrum 10.33 per cent have a per capita income between Rs.2001- Rs.3000/-, where these families have more than one wage earner. How ever, several incidences have proven the fact that income alone does not guarantee a good standard of living or food adequacy since; these factors are controlled by the expenditure pattern of the families. In other terms the family budget and the resource management procedure with in the family is expected to lead a better living.

Food is the major vehicle for improving the nutrition of people and is markedly influenced by income level. The present study revealed that 63.33 per cent of families were found to spend an amount between Rs. 501/- Rs.2500/-, while 36.67 per cent only spend an amount below Rs.500/- for food. A survey conducted by NIN (1991) revealed that the dietary intake was found to be

markedly influenced by income level. The result revealed that more than 75.00 per cent of the family's income was found used up for providing food. Wong *et al.* (1985) found a direct relation between family income and expenditure on food. Lipton (1989) in his study on under nutrition and poverty had reported similar results. Report by Kamal (2000) was also in line to the above result. According to Devadas (1991) in Tamil Nadu a maximum proportion of the income (61.80%) was spend on food by families of low socio-economic strata. The present study also established the fact that poor households will spend higher proportion of their income on food.

The expenditure incurred on various non food items also reflects another aspect of the quality of life. Dhanasekharan (1991) stated that mass poverty can be recognized in the form of shabby clothing since clothing satisfies a basic need next to food. 86.33 per cent of families were found to spend an amount below Rs.100 for clothing and these may be due to the low purchasing power of the families. 63.00 per cent of the families surveyed was not spending any money for shelter, since they have their own house and were not interested in spending money for its yearly maintenance. 18.00 per cent of families opined that the rent which they are paying was not affordable. Some families reported that they could not afford to do the maintenance work of their thatched house even once in a year.

It was also found that 67.67 per cent of the families spend less that Rs.100 for transportation since most of the members had to travel a short distance to the work site. It was also observed that 69.00 per cent were not spending any amount for education, since they have only grown up children.

The expenditure on medical care and health showed that 40.00 per cent were spending an amount greater than Rs.500 per month. These families were found to have sick and older persons as well as infants, who need a sizable portion of income for their treatment. Most of the families were found to be depending on Government dispensaries and Primary Health Centers for most of the ailments they had.

76.00 per cent of households are electrified, whereas all the house holds spend an amount below Rs.100/- for fuel. The expenditure incurred for religious and social function ranged from Rs.50-200/- and is mainly utilized for purchasing wedding gifts and as donation for religious ceremonies. Deshpande *et al.* (2001) had reported that the monthly expenditure on various food and non food items increased as the monthly income of family increased, except for the expenditure on protective foods like pulses, vegetables, fruits, milk and milk products. The results are in line with the study conducted by NIN (1985), that in low income groups over 90.00 per cent of the family's income is used up for providing the essentials such as food, clothing and shelter.

According to Ramankutty *et al.* (1993) information on aspects such as smoking, alcohol use and tobacco chewing should be deemed as important as they are the contributory causes to a number of chronic and fatal diseases. In the present study it was found that 8.67 per cent had no expenses related to alcoholic drinks, while it was surprising to know that 87.33 per cent were spending an amount greater than Rs 500/- per month for alcohol. Vijayan (2003) in her study found that landless agriculture labourers in Thiruvananthapuram spend an amount between Rs.50 to Rs.840 every month for conventional habits. She also pointed out that this practice was found to drain their income, and if it is diverted to procure food could definitely improve the food security of these families.

Information related to the saving pattern of families showed that 100.00 per cent have the habit of saving some amount per month. Details enquiry revealed that this habit was developed as a result of the saving scheme of Kudumbasree, in which at least one individual in each family is a member. It was observed that they were having chittis, LIC polices and post office deposits as savings.

The interesting feature noticed regarding saving is that women are most interested in saving money than men. Apart from the nature of savings, a distressing phenomenon noticed in the study was the money borrowing nature of the families. It was found that the money borrowed ranged from Rs.100 to

Rs.1, 00,000. Higher amount borrowed was mainly to conduct the marriage of their children and also for payment of dowries. Usually amount borrowed was mainly utilized for satisfying the different needs of the family members. The Kerala Statistical Institute (2001) has also reported that on an average the rural area had a larger per cent (63.80%) of households with debts as compared to the urban house holds (24.30%). It was observed that many of the respondents did not like to reveal details about their debts but it can be inferred that the hose holds which debts had seemed to be in the clutches of a vicious cycle. On account of their low income coupled with extravagance on social functions like marriage, birth ceremony and death rituals, the households remain perpetually indebted to the money lenders. Further unforeseen and unavoidable expenditure for treatment of serious diseases elevated their debt.

As far as the source of borrowing money was concerned 32.33 per cent borrowed from private financiers, to whom they had to pay a high rate of interest, by pledging their property or other assets. Consultation with the family members revealed the fact that formalities to be followed for borrowing money from private money lenders is more easy than taking loans from Government banks, even though their rate of interest are very high. They also opined that formalities to be followed for taking loans from Government banks are very difficult and it takes lot of time, and that it will not serve their need, in time. They also reported that if the money needed is smaller they mainly borrow it from friends, relatives or neighbours. Their habit of borrowing money pushes them to more poverty. Ranganathan (1996) conducted a study among coir workers and reported that maximum number of families borrowed money to meet daily household expenditure. A study carried out by Vijayan (2003) has also pointed out that apart from the nature of savings, families borrowed money to meet their food expenditure, and they also opined that negative balance shown in their budget was partially due to their borrowing habit. A similar situation was noted among the families where their wages was insufficient to maintain their family and quite often they had to resort to borrowing. They also opined that when, they had no job

during off seasons, the money saved will be completely utilized for meeting the families day to day expenses.

Information related to both savings and debts revealed a negative picture. Along with these details collection of information on the economic problems of the families would be helpful because it would give a clear picture of the needs of the families and also the package of interventions needed to uplift these families. Details related to the most important economic problems ranked on a priority basis showed that, of the various economic problems listed, lack of permanent employment was the most important problem that they faced. High price of commodities, problems related to economic burdens imposed by repayment of loans and lack of male earning members, high medical expenses, lack of housing facilities and other day to day expenses were the other problems listed, in the priority order as felt by the respondents. Family income determines the family status and socio economic strata of the society to which they belong. Lack of permanent employment was the most important economic problem which was reported by 100.00 per cent of families, creating untimely economic depression in the families that push them into poverty.

Poor availability of assets and housing was reported to be a major problem faced by the families belonging to low socio-economic groups. 7.67 per cent of BPL families were not having any land and they are living in rented or leased houses. 82.00 per cent of families have their own house which was reported to be with in 5 cents.

Housing condition would reflect the physical amenities and quality of life to a certain extent. The roofing pattern of the house showed that the traditional thatched house is disappearing slowly, and almost all are constructing terraced or concreted roofed houses. Floor made of cement was found in majority of the houses. Walls are being constructed with hollow bricks by 59.33 per cent of families instead of coconut leaves, brick or mud. Maximum number of families is reported to be having 2 rooms. Further enquiry shows that they got assistance from Government for the building and maintenance of their house. They also

opined that thatching roof once in a year is very expensive and it is not affordable whereas concreted buildings are durable and safe. A rapid transition of rural community in housing also reflected in their changing standard of living.

Facilities available within the house go a long way in deciding the quality of life and also in reducing drudgery and providing healthful living environment for the family. Distribution of the families regarding the source of lighting shows that 92.00 per cent of households are electrified.

However in the present study 49.67 per cent of house holds still depends on firewood for cooking food, whereas the rest used kerosene, sawdust etc. They opined that the high cost of LPG force them to buy fire wood.

As far as source of drinking water was concerned only 31.67 per cent of families had their own well or pipe rest of the families depended on public and other means for water. In Kerala, piped water is provided to 204 lakh people which comes to around 64.00 per cent of the total population, out of these 138 lakhs (68%) are rural and 65.61 lakhs (32%) are urban people (Economic Review, 2003.a). Visual examination of water which proved to be unhygienic is the cause of most contagious diseases among the people living below poverty line.

The availability of latrine and drainage facilities were looked into to asses the sanitary conditions of the house and the surroundings. It showed that 22.67 per cent of families were not having latrine facilities and they defecate near by open places around their houses. The rest of the latrines were built with the assistance of Government. None of the families were having drainage facilities. It was further noticed that, waste water from households was allowed to drain into small ditches made near by their houses. They opined that this creates the problem of mosquitoes and foul smell. The neatness and sanitation inside and outside the house was ranked as poor for most of the families.

Enquiry in to the utilization of health care facilities shows that 66.00 per cent use the facilities available in Government hospitals, mostly Medical College, General hospital and Thycaud hospital in Trivandrum. It was also noticed that

28.00 per cent consulted nearby primary/community health centers. It seems that 6.00 per cent of families where utilizing the services of private hospitals for better treatment. Low economic background pushes them to utilize the facilities available in government hospitals, inspite of getting poor care and low facilities. These findings are in line with the findings of the earlier studies.

5.2 RURAL QUALITY LIFE INDEX

In order to find out the extend of poverty among the families under focus, attempt was made to assess the quality of life enjoyed by these families. From the socio economic data collected a Rural Quality Life Index (RQLI) as suggested by Dhanasekharan (1991) was worked out to measure the extend of poverty among the households. RQLI showed that none were recognized as destitutes, whereas 6.67 per cent were categorized as very very poor and 22.33 as very poor. It was also found that 63.67 per cent of them were poor and 7.33 per cent as non-poor. It shows that 92.67 per cent were found to be poverty stricken. The fact that families having poor RQLI, living below the poverty line could have a direct detrimental effect on the nutritional status of families. Present study reveals high significant and positive correlation between the RQLI and Nutritional status of women ($r = 0.9829^{**}$).

This results support the result of Economic Review (2003.a) which revealed that Kerala has poverty figures of 9.38 per cent in rural areas. According to their report there were nearly 17.23 lakh families below poverty line in Kerala. Kerala Women's Commission (2003) conducted a survey and identified that destitute families constitute 2.00 per cent of the population in Kerala, and 604 families in Thiruvananthapuram district were reported as destitutes. The report also gives a shocking data that 34.00 per cent of them do not have access to minimum food and in all probability they are outside the food security system. Similarly 45.00 per cent of them do not have any social security assistance, half of them have no drinking water facilities and three fourth of them have no sanitary latrines.

Alcoholic or drug addict, Scheduled Caste/Scheduled Tribe, family with one or no adult employed, family with no asses to safe drinking water are the four major risk factors identified on priority basis. Kerala Women's Commission (2003) reported that in rural and coastal. On contradiction no destitute families were found in the present study.

5.3 POVERTY INDEX

Attempt was made to study the families "at risk of poverty", using a risk factor analysis suggested by Srilatha and Gopinathan (1995). Presence of an alcoholic or drug addict (91.33%), family belonging to scheduled caste/scheduled tribe, family with one or no adult employed, family with no access to safe drinking water are the four major risk factors identified on priority basis. Kerala Women's Commission (2003) reported that in rural and coastal areas the practices of alcoholism, playing cards and smoking are the main contributory causes for poverty. According to Ramankutty *et al.* (1993) information on aspects such as smoking, alcohol use and tobacco chewing should be deemed as important as they are the contributory causes to a number of chronic and fatal diseases. The report also pointed out that this flow of meager money earned for undesirable purposes affect or make a negative impact on health status of the family members especially women and children. Statistical analysis of the RQLI and Poverty Index when analysed showed a positive correlation ($r = 0.6927$).

5.4. PERSONAL PROFILE

Personal profile of an individual plays an important role on the pattern of consumption of foods and nutrients. Personal profile of 300 middle aged women was collected and were analysed against the back ground of their nutritional status.

Age wise distribution of 300 respondents showed that 40.33 per cent were in the age group of 51-55 years, while 30.67 percent were in the age group of 46-50 years and 29.00 per cent in the age group 40-45 years. Age wise distribution shows a gradual increase in number of women, when the age increases from 40-55

years. This shows the changing picture of Kerala, where the sex ratio and life expectancy favours women population. Economic Review (2003.c) reported that the proportion of 60+ females is increasing in rural areas (7.23%) than urban areas (7.04%) which is also reflected in the present study. The sex ratio indicates the survival scene of women in Kerala. High female life expectancy indicates that the number of old women will be on the rise. The proportion of the aged females is highest in Kerala compared to other states.

Marital status plays an important role with respect to the socio-economic differentiation, women have to face. The result shows that 99.00 per cent were married, while widows constituted 19.00 per cent of the population. It was observed that these women are living with out their partners with in the age of 55 years, where they had to face all the responsibilities of their family. Marital status also influence work performance. Divorce (2.67%) separated (10.00) and widowhood (19.00%) was observed to cause marital dissatisfaction which produces mental stress and strain which indirectly affect the nutritional and work performance. Ranganathan (1996) noticed in her study that older women who were married have better decision making powers than unmarried women.

According to Aristotle, education is meant to develop man's faculties, especially his mind so that he may be able to enjoy the contemplation of supreme truth, beauty and goodness. Education of women has been recognized world over as a critical variable in improving their status, infusing knowledge and skills relevant to their role in socio-economic development and in refining their ability to make decision in activities with developmental objectives and goals. Devadas (1991) revealed that prevalence of nutritional deficiency diseases was higher among people with lesser educational status than in highly educated groups. Hence educational status of the respondents was considered as an indicator of their quality of life. The result of the study shows that 8.33 per cent of total women population is illiterate, and majority had education up to high school. At the National level 45.80 per cent of the female population is illiterate as against 12.40 per cent in Kerala (Government of India, 2001). Women who studied above

high school were not able to complete the course mainly due to breaking of course due to marriage, low interest in studies, poverty, illness and other socio economic problems. The increased poverty and its resulting misery and the burden of work in addition to the lack of physical and emotional support from the family make these women remain as an oppressed class particularly in educational field in the society. Economic Review (2003.c) pointed out that literacy status of women in Kerala is unique with 88.00 per cent compared to all India level of 54.00 per cent whereas in Thiruvananthapuram it is only 86.26 per cent which is below the state average. Family's educational status showed that present generation is more educated than the older generation. Educational status and literacy rate have been prove to be powerful determinants of nutritional status as it may influence the awareness of the importance of good nutrition, which can affect food choice. This is in line with the observation of Steek *et al.* (1991) who observed that women with more education had food consumption patterns more consistent with current health promotion messages.

Occupational status directly or indirectly influences the health condition of an individual. Misra (1989) had stated that female earnings should be considered as an indicator of quality of rural life. In the present study 50.67 per cent middle aged women were unemployed and the remaining were doing small jobs like private employment, pettibusiness, stone breaking, agricultural labour and other cottage industries and allied activities run by Kudumbasree units. It was noted that half of the women were unemployed and this accounts for the cause of poverty and low health status among the BPL women. Several studies have acclaimed that poverty alleviation and income generation go hand in hand for improving nutritional status of BPL women.

The result also points out that all these employed women where working in private or unorganized sectors where income is very low. Apart from their daily wages they were not getting any other benefits. The report of Government of India (2001) has also pointed out that work participation rate of women has always been lower than men in rural as well as in urban areas both at national

level and in Kerala. The report also revealed that work participation rate of male is 50.20 while that for female is only 15.90 in rural Kerala. In the present study also men had better work participation than females.

A high significant correlation (0.6231) was found between employment and nutritional status of women. Nathawat and Mathur (1993) reported that employed women secure higher scores for general health, life satisfaction and self esteem. Increase in women's income is translated more directly into better health and nutrition of their children. Johns (2001) has also reported that women's employment is found to benefit the working women themselves and their families since the income generated would increase the purchasing power and standard of living with consequent improvement of nutritional status.

A woman's status in family would be definitely related to whether she is engaged in gainful economic activity and earning an income. It is observed that 49.33 per cent of the women were not having any income of their own and were depending on others for their daily needs. Further analysis showed that 32.33 per cent earn monthly income below Rs.500. None was reported to be earning above Rs.1, 500. Dietary intake was found to be markedly influenced by income level as it is accepted that an insufficient level of real income is the main cause for inadequate food consumption among the women as reported by (Antony and Chatterjee, 1999).

Women's autonomy cannot be enhanced without addressing their economic independence, but this remains a very distant goal for most women. In the present study, the fact noticed is that half of the female population is in the age group 40-55 years, are unemployed whereas the rest are earning a very low income with maximum energy out put, which makes them nutritionally deprived. The study also infers that majority of the women are contributing a substantial amount of their income to the nutritional and health needs of the family, whereas men spend major portion to satisfy their persona needs.

Women's control over their money shows that 51.00 per cent were able to spend money only with the permission of their husband, and it is surprising to see that 14.00 per cent have no freedom to spend money. The rest 35.00 per cent were able to spend money without the permission of husband. This shows that women were still having no control over their resources. Most of the women revealed that their husband other beat them, if not giving money for drinking alcohol. Also it was found that women were economically insecure due to the alcoholic habits of their husband. NFHS (1999) shows that in Kerala, 23.00 per cent of women who earn cash have no decision about the use of their earnings while 42.00 per cent make decision of their own. The report also shows that 59.00 per cent of women have access to money at the All India level, and it is 66.00 percent in Kerala.

Personal habits of the women gives a shocking picture that 9.00 per cent of the women studied are having the habit of smoking beedi and 2.67 per cent consumed alcohol occasionally, while 35.00 per cent had the habit of chewing betel leaves. The reason for these habits, were varied ranging from pleasure, help to relief tension and work load. The data also showed that 53.33 per cent of women are having no such habits. Ramankutty *et al.* (1993) indicated that habits such as smoking, alcohol use and tobacco chewing should be viewed as important as they are one of the contributory causes to a number of chronic and fatal diseases. Many researches done all over the world shows that different forms of cancers are increasing among middle aged women mainly due to their unhealthy habits.The investigation done by George (2002) also established that fisherwomen suffering from oral precancerous condition are from low socio-economic strata. Several studies had also associated the conventional habits of women and a poorer profile of morbidity and morality in areas with low level of socio economic indicators. Gomez (1990) had reported that alcohol consumption and smoking have a direct negative effect on appetite, inhibiting desire for food there by limiting intake of nutrients.

Empowerment of women and equality between women and men are pre-requisites for achieving political, social, economic, cultural and environmental

security among all people. Participation of middle aged women in social/voluntary activities revealed the picture that 79.33 per cent of women were engaged in activities as member whereas 12.00 per cent as active members. In Kerala decentralization and the innovative poverty alleviation programme 'Kudumbashree' had provided wider opportunities for women to discover their potential and provided scope for interaction in the society. The study also revealed that majority of women was members in the Self Help Groups.

5.5 HEALTH AND REPRODUCTIVE HISTORY

Details related to the health history of the subjects were collected to get an accurate account of their health and to see this against the background of their life as a whole. The health problem when enumerated in general revealed the fact that, skin diseases (56.00) followed by arthritis, osteoporosis, diabetes mellitus, and hypertension was prevalent among the subjects. Thyroid enlargement which is a common feature of iodine deficiency is observed among 6.00 per cent of the population. Hypertension is the commonest cardiovascular disorder, posing a major public health challenge to societies in socio-economic and epidemiological transition. Kruse and Horsch (1993) reported that a faulty diet and stress plays a major role in causing hypertension. A study conducted by Singh *et al.* (1996) among rural adult women in Nepal revealed that arthritis and osteoporosis were the common diseases found among the subjects. Several research studies revealed that bone loss is greater in middle aged women than in men of same age and hence women have to face several locomotor problems. Apart form the specific disorders, majority of the subjects were reported to be suffering form problems like, lack of appetite, sleeplessness poor vision general weakness, high stress and strain and abnormal sweating. According to Silberg (1995) prevalence of osteoarthritis and osteoporosis in women steadily increases with age and it affects women more than men.

Age wise distribution of menarche among middle aged women in general revealed that majority (58.00 per cent) attained menarche at an age between 12-15 years whereas 30.33 per cent after an age of 15 years. A report published by

Kerala Women's Commission (2003) on the status of women in Kerala showed that 80 per cent of adolescents have their menarche between the ages 12 to 15. The report also indicated that late menarche among adolescents living in slum and coastal areas may be due to their poor intake of nutritious foods especially iron rich foods. The result of the present study is in line with the above observation.

Age at marriage was an important factor which determines the reproductive health status of women. It was observed that majority married between an age of 19 - 21 years and only 9 per cent married after the age of 25 years. This showed the fact that 98.00 per cent of the rural women married before an age of 25 years. Health indicators projected from Health Report (2001) gives the mean age at marriage in Kerala as 22 years.

Age at first conception and delivery has great importance because effective reproductive span begin at this age. The age of first pregnancy is an important demographic determinant of fertility. The age at first conception for the majority of the subjects was reported to be between 18-25 years.

The data on the nature of delivery showed that 77.00 per cent had normal deliveries, while rest had at least one episodes of complication at child birth, such as premature delivery, caesarian and still births.

Reproductive health problems mainly repeated abortions, irregular menstruation, uterine problems and problems associated with menopause were noticed among majority of subjects under study. The problems associated with reproduction, may be due to the poor antenatal care received or may be due to anaemia or infections. All these problems may afford a great challenge to the reproductive child health status of women in Kerala.

Comparing the past health history and present health status of the sample, it could be observed that as age advances, there is a great challenge to the reproductive and health status of middle aged women. The study realizes the critical need to improve the quality of reproductive health status of middle aged women.

5.6 STRESS AND STRAIN

Present study revealed that 59.67 per cent of the subjects are suffering from severe stress and strain. Deltabuit (1991) reported that women experience more anxiety, panic and sleeplessness, inviting various body ailments, accidents and self inflicted violence. The authors also indicated that the stigma of childlessness, physical disability or widow hood and economic and social problems can also lead to imbalance and illness. Mellner and Christin (2003) pointed out that contemporary factors such as job strain, low income, financial worries and double exposure in terms of high physical and heavy domestic responsibilities increased the risk for poor self- reported health in middle aged women.

5.7 NUTRITIONAL PROFILE

Assessment of the nutritional status of a community is one of the first steps in the formulation of any public health strategy to combat malnutrition, which aims to determine the type, magnitude, distribution, contributory factors and to identify the at risk groups. In addition, factual evidence of the exact magnitude of malnutrition is essential to sensitize administrators and politicians and to obtain, allocation of resources and to plan appropriate intervention strategies. With this aim nutritional profile of 300 middle aged BPL women were ascertained by recording their dietary profile, anthropometric profile, clinical status and haemoglobin levels.

5.7.1 Dietary Profile

Food is the major vehicle for improving the nutrition of people, and hence assessment of food consumption and dietary habits of people is very important. A diet survey was conducted as a preliminary step to determine the dietary profile of middle aged women. Food consumption pattern is an essential pre-requisite for

planning food needs, and in the present study the diet survey revealed information regarding the food habits, monthly food expenditure, frequency of use of various foods, frequency of purchase, frequency of cooking and distribution, frequency of meals consumed, daily meal pattern, frequency of use of micronutrient rich foods, and actual food and nutrient intake. The results of the diet survey are discussed below.

The food habits of the subjects revealed that all the 300 (100.00%) subjects were non-vegetarians. Though they were all branded as non-vegetarians it was observed that the consumption of fish was high among the respondents, and they rarely consumed other non-vegetarian food items. This is in line with the earlier studies conducted in KAU by Felsy (1989), Suja (1989), Sujatha (1990) Jyothi (1993), Karuna (1993), Ranganathan (1996) and George (2002) revealed that food consumption pattern of rural women in Thiruvananthapuram was habitual non-vegetarian type.

The expenditure for the purchase of different food materials showed that, rice and wheat were purchased at an amount below Rs.400/-. The Public Distribution System (PDS) was observed to contribute a great deal to the purchasing power of BPL families in Kerala, and the families in the present study were found depending on ration foods, which is distributed at subsidized rate i.e. Rs.3/kg for rice under the scheme of Antyodaya Anna Yojana. The scheme provides 35 kg of rice per month and also the entire requirement of kerosene which is a basic need for cooking, or lighting poorer households. They revealed that sometimes, the rice which they get as ration was of poor quality.

The amount spend for the purchase of pulses was negligible and was below Rs.50/-. They opined that high cost of pulses, prevent them from buying even though it is considered as poor man's protein.

Roots and tubers, considered as the second staple food of Keralites were purchased for an amount below Rs.100/-. Purchase of vegetable was found to be between Rs.50 – Rs.100/- by majority of families and the purchase of green leafy

vegetables was also very low which was below Rs.25/-. Oil and fats were purchased at an amount less than Rs.50/-, which is considered to be very low, like vise amount spend for nuts and oilseed was also below Rs.50/-, which showed the poor purchasing capacity. Fruits which are rich in vitamins and minerals are purchased for below Rs.50/- per month only.

Milk and milk products were purchased for an amount below Rs.100/- by 96.00 per cent of families. The milk mostly purchased from milk venders are used for making tea and for feeding children.

Sugar and jaggery were purchased for an amount below Rs.50/- by 100.00 per cent of families It was also observed that for effecting the purchase of fish, 81.00 per cent of families spend an amount between Rs.200/- to Rs.300/-, which indicates the high rate of fish consumption even among the lower income brackets in Kerala. The purchase of meat and egg was found to be rare for Rs.50/- by majority of the population, which shows the lower purchasing capacity of body building foods by the families.

Regarding the purchase of food from out side home, 40.67 per cent spend an amount below Rs.100/- while 26.66 spend on amount between Rs.101/- Rs.300/-. A special feature noticed was that male members spend sizable portion of their income for having food out side home which may negatively influence the family food budget.

The food expenditure pattern for various consumables revealed that, the families food budget was primarily controlled by the purchase of cereals followed by fish, food out side home, milk and milk products, nuts and oilseeds, other vegetables, roots and tubers. The lowest expenditure were recorded for effecting the purchase of green leafy vegetables fruits, pulses, sugar, oil and fats, meat, egg and bakery/ processed products. It was further noticed that amount spend on food outside home and bakery/processed food were increasing among BPL families in rural areas too. The fast transition from traditional Kerala diet to the fast food system could lead to develop diet related degenerative diseases among BPL

families. The result also shows that, male workers were having a increasing trend of taking food from out side home which range from a cup of tea to meals.

Regarding the frequency of purchase of foods it was observed that majority of the families purchased rice weekly while only 4.00 per cent purchased on daily basis as part of their daily diet. Wheat was also purchased and used but to a lesser extend. This result was in tune with the study conducted by Renganath (1996) among women coir workers in Thiruvananthapuram. As far as the purchase was concerned all families purchased rice from ration shop where they get it at a subsidised rate.

As far as the frequency of purchase of pulses was concerned, it was interesting to note that 11.00 percent of families never purchased pulses, where as majority purchased it occasionally, which is not in the measures stipulated for a balanced diet. The quality of pulses purchased in these families was found inadequate to meet the daily requirement of the family members. Consumption pattern of Keralites, as reported by Kerala Statistical Institute (2001) revealed that 98 per cent of the Keralites are habituated to non-vegetarian foods and hence cheaper fish based preparations were preferred to extra vagant pulse based preparations. This might have been the reason for the less frequent purchase and use of pulse based recepies. Other vegetables were purchased on daily basis (46.67%) by majority of families while, 42.00 per cent purchased it weekly. Other vegetable were observed to be included in their daily diet by majority of population. Green leafy vegetables was purchased occasionally by majority of population, while 11.00 per cent never used this item in their diet, which revealed the need for inclusion of green leafy vegetables in the daily diet. The respondents were found aware of the availability of these vegetables locally but were found reluctant to use the same in the daily diet. Comparatively more vegetables were found purchased by these families but not enough to meet the individual requirements of the family members. Low use of green leafy vegetables can definitely lead these families to the micronutrients malnutrition.

Purchase of roots and tubers revealed that majority of families purchased it daily. Tapioca the commonly used tuber crop, was purchased daily by most families and was found to have equal preference and importance to cereals, despite their lower content in micronutrients and these food crops were found to reduce substantially the cost per calorie when compared to cereals. The other items which come under roots and tubers that were purchased occasionally by these families were carrot beetroot, and potatoes.

Fruits which come under protective foods were never purchased by 65.67 per cent of families. The commonly used fruits among the BPL families are banana and tomato among the BPL families. Low intake of fruits among the families results in micro nutrient malnutrition mainly vitamin- A deficiency.

Milk was daily purchased by the majority of population while 4.00 per cent abstained from buying milk.

Fats and oil seeds (coconut) were purchased weekly once by 94.33 per cent families. Sesame seeds were not found to be used, whereas ghee was found to be purchased occasionally by all families, especially on days related to festival occasions. The population seems to purchase coconut on daily basis and ground nut on weekly basis. Palm oil is the oil they mostly purchased. Sesame oil was not found to be purchased, except for pickling.

Results based on purchase of fleshy foods revealed that fish was purchased daily, while meat was purchased occasionally by all the families. Egg was seen purchased occasionally by majority of families under study. Spices and condiments were purchased on weekly basis by majority of families, where they purchase small quantities to satisfy their immediate needs. Miscellaneous foods and health drinks were occasionally purchased by the family members.

Frequency of use of various food items among the 300 middle aged women showed that energy rich foods like cereals, nuts and oil seeds (coconut), fat and oil sugar and jaggery, spices and condiments were used daily by all the women in their diets. This is also in accordance with the findings of Srinivasan *et*

al. (1991). Considering the use of roots and tubers, 58.33 per cent of the subjects included these items daily in their diet and it was noted that tapioca is the commonly used tuber crop. According to ICMR (1994) tapioca is the most commonly consumed tuber by the common population of Thiruvananthapuram. The reason is its easy availability and low cost compared to other tubers. Due to the same advantage it is used as the staple food among the BPL families. The main use of sugar was found for preparing tea or coffee.

Regarding the use of protein rich foods it was noted that most of subjects included fish daily in their diets, which indicates that in Kerala even those from the lower income brackets consume fish. Among the various dishes, fish based preparations were found preferred by all the families. This feature was supported by Karuna (1993) Nayak (1992), Ranganathan (1996) in their studies. At the same time there was only an occasional use of other protein foods viz., pulses, meat, egg, milk and milk products. Use of milk and milk products in the dietaries was also observed to be depended on tea or coffee drinking habits of the respondents. Similar results were also obtained from Karuna (1993), Jyothi (1993) and Kavitha (1999) in their studies among fishermen families, stone breaking women and adolescence girls respectively. According to NIN (1993) 96.00 per cent of the population consumed an inadequate level of pulses as compared to cereals. The similar pattern in frequency of use of these food items was observed by Vahab (1997). The comparatively, higher cost of protein foods can be pointed out as the reason for the less frequency the use of meat, egg, milk and pulses.

Consumption of vitamin and mineral rich foods revealed an occasional use of leafy vegetables and fruits. Consumption of other vegetables was found to be daily by 53.67 per cent of the subjects. Diet survey conducted among fisher women by Krishna (1988) and Karuna (1993) showed that foods like vegetable and fruits, which are major sources of vitamin and minerals, are rarely included in the diet. The low frequency of use of green leafy vegetables and fruits indicated the ignorance on the importance of this food groups and is reflected in their health

status assessed by biochemical tests. The rare use of these food items could be related to their habitual pattern of diet consisting of rice, fish and tapioca.

Frequency of cooking meals revealed that 66.00 per cent of families cooked meals once in a day while 32.00 per cent and 1.67 per cent of the subjects cooked twice and thrice in a day respectively. Cooking once in a day pattern was mainly followed in the household where the female have employment. Cooking more than once requires more energy and time. Frequency of meals consumed showed that majority had the habit of consuming three meals day namely break fast, lunch and dinner. Intra household distribution of food observed that 65.33 per cent took food according to the convenience of the members and none of them followed a specific schedule. Meal timing varied from person to person may be mainly due to the varying work pattern of the family members.

The regular meal pattern of the subjects when studied revealed that all the subjects were non-vegetarians. Their diet primarily consisted of cereals, other vegetables, roots and tubers and fish. Actual meal pattern revealed that the diet consisted of a cereal preparation forming the major constituent of three meals, with lunch consisting of cooked rice and tapioca served that fish curry some times along with a vegetable preparation. Lunch was the major meal of the day and the leftover of which was used as dinner. Kumari (1993) and Vijayan (2003) reported that the diet of agricultural labourers was based on rice, fish, tapioca and coconut. Ranganathan (1996) had reported that the diet of coir workers was found to predominate in cereals. This is the replica of the general dietary pattern of Keralites belonging to low socio-economic groups which is ill-balance. The consumption of tubers (tapioca) and fish were high and the diets of these subjects were found to be uniformly low in protective foods like pulses, vegetables, meat, milk and fruits. The above finding is similar to the one reported by Issac (1990) who observed an inadequate dietary intake among the women coir workers of Kerala and that rice and tapioca with fish featured frequently in the diets which were devoid of meat, eggs, fruits, milk and vegetables.

UN weekly (2004) reported that health of one third of the world's population, approximated to be two billion, is damaging due to lack of vitamins and minerals in the diet. Micronutrient deficiencies are common in many developing countries and are typically due to inadequate food intake, poor dietary quality, poor bioavailability and /or the presence of infections. Data regarding the use of micronutrient rich foods in the daily diets among 300 middle aged women were collected to find the inverse relationship between the intake of micro nutrient rich foods and the presence of micro nutrient malnutrition.

Rice flakes and wheat which are good source of iron, was also occasionally consumed by majority. Majority consumed pulses occasionally. Roots and tubers like carrot, potato, sweet potato, which are good sources of β - carotene were consumed occasionally, or never by majority of the subjects.

β-carotene and iron rich vegetables like amaranth, drumstick, beans, snake gourd, cabbage, agathi and bitter gourd were used occasionally by the subjects. However few subjects included these items weekly in their diets. Study by Ryan *et al.* (1994) covering families in six villages of south India revealed that these people consumed low amount of vegetables and the quantity consumed was subject to seasonal variations. Fruits like jack fruit, papaya, orange, mango and dates which are rich in β- carotene and iron were consumed occasionally by majority of subjects. Banana was the only fruit which was consumed weekly by 25.33 per cent of subjects. Ranganathan (1996) pointed out that this trend of low intake of protective foods like vegetables and fruits is the common feature of the diets of low-income groups. Ryan *et al.* (1994) observed that the consumption of fruits were invariably absent in the diets of people living in villages of south India. Srinivasan *et al.* (1991) and Karuna (1993) also have reported this feature in the diets of fishermen community. Decreased intake of green leafy vegetables and fruit by these women was found mainly due to the high cost, ignorance and indifference to these food groups. Coconut was incorporated for the preparation of side dishes by 100.00 per cent of subjects, whereas ground nut was used occasionally by the subjects. The data also showed that fish and milk was

consumed daily by majority of subjects. Egg and meat were rarely used by the subject, whereas liver was consumed by none of the subjects. Result of the study indicated that frequency of use of micronutrient rich food were only occasionally included except, fish, milk, coconut, and coriander/curry leaves.

Actual Food intake

The actual food intake of the 300 subjects were assessed by conducting one day recall method inorder to determine the quality and quantity of food and also the nutrient content of the diet consumed by the women. Food recall survey revealed that the intake of various food was not balanced or adequate.

In the present study the intake of cereals, met 93.14 per cent of the RDA, how ever the deficiency of cereals was partially substituted by roots and tubers consumed in excess with an average quantity of 53.38 g against an RDA 50.00 g. According to ICMR (1994) cereals intake was 74 to 95 per cent of the RDA in Thiruvananthapuram. But the intake of food items like pulses, other vegetables, fruits, milk and milk products, fleshy foods including meat and egg were very low compared to their RDA. Fish was the only flesh food, which majority of them consumed. Being an inevitable item of Kerala dietaries and having easy accessibility and available at cheaper rate, fish consumption rate was almost satisfactory next to cereals. The consumption of cereals, other vegetables, fish, sugar and jaggery however met above 50.00 per cent of their respective RDA. It was observed that the intake of green leafy vegetables, fruits, milk and milk products and fats and oils were below 50.00 per cent of their RDA. The relatively reduced consumption of body building and protective foods including green leafy vegetables and fruits might be the reason accountable to the low micronutrient status among middle aged BPL women.

Chandha *et al.* (1995) in their study found that there was a higher consumption of cereals, roots and tubers and lower intake of pulses, vegetables, flesh foods and fruits by the rural population. The data presented by NNMB (2000), while comparing average consumption of different food stuffs consumed

by 6408 families in Kerala through repeat survey conducted over a period of 20 years from 1975 to 1995 have revealed that average consumption of cereals and millets was marginally lower than the RDA while that of pulses and legumes was about half the RDA. The intake of green leafy vegetables and fats and oils was less than one fourth of RDA, while that for other vegetables was satisfactory. This result also highlighted that there was considerable improvement in the consumption of milk and milk products, fats and oils and sugar and jaggery over the years.

Ranganath (1996) reported that the common feature of the diets of the low income groups is the low intake of protective foods like pulses, vegetables, fruits, milk, oils and fats and flesh foods. The food intake of middle aged BPL women was also observed in tune with the above finding on rural population. Ranganath (1996) reported that the dietary intake of women coir workers in Thiruvananthapuram was found to predominate in cereals, tapioca and fish, whereas pulses, vegetables, milk, fruits and flesh foods was found to be inadequate.

Actual nutrient intake

Though food is necessary to satisfy the emotional and social requirements of man, from the nutritional point of view, food is also required to meet the supply of different nutrients that are required either to provide energy or to build up the body or to maintain and repair the tissues or to regulate body processes. In order to maintain the homeostasis of the body the nutrients are to be supplied in amounts recommended for healthy living. Hence the nutrient content and adequacy of the diet consumed by the subjects were computed. The results revealed that intake of calories met 98.40 per cent of RDA, whereas protein intake was notably poor with an adequacy of only 52.08 per cent of RDA. This low intake of calorie and protein may be due to the inadequate intake of energy and protein rich foods. A study conducted by George (2002) among pre malignant middle aged women shows that calorie intake was below 75.00 per cent of the RDA. A study conducted by Karuna (1993) among fisher women revealed that

their diet was inadequate in calories and protein. Studies done by Ranganath (1996) among coir workers and Vijayan (2003) among agricultural house holds showed that the intake of protein was especially high among these groups mainly due to the intake of fish. In the present study it was noticed that even though the households purchased fish every day, the amount spend for purchasing fish was very less ie below Rs 10/-. It was also observed that women being the least and last eaters consumes only a least portion, which is inferior in quality and quantity.

Calcium intake was found to meet only 69.25 per cent of RDA and this was mainly due to the consumption of fish. It was also noticed that intake of leafy vegetables, milk, egg, and meat which are good sources of calcium are found inadequate among the subjects.

The intake of iron, vitamin-A, vitamin-C and thiamin were poor among the subjects. It should be emphasized that vitamin-A and vitamin-C is the most limiting nutrients found in the diets of the women and may be due to the poor consumption of protective foods, including fruits and vegetables (Nelson, 2004). Only 50.93 % of the RDA for iron was met from the diet consumed by these subjects would invariably lead them to suffer from iron deficiency anaemia which may affect their working efficiency. Studies which were previously done on women from rural back grounds, also revealed similar findings. Nagi and Mann (1991) conducted a study on the nutrient intake of Punjabi women and they reported their mean dietary iron intake was inadequate. A study conducted by Chandha *et al.* (1995) reported that the intake of total calories, iron, retinol, riboflavin and vitamin-C was less than RDA in rural population.

A study conducted by Sujatha (1990) revealed that the diets of women engaging stone breaking were also found to be deficient in retinol, iron, thiamin, riboflavin, niacin and vitamin-C. Prasad *et al.* (1995) stated that low intake of carotene, iron, thiamin, riboflavin, folic acid and vitamin-C among middle aged women will have a higher risk of developing oral cancer.

Assessment on the nutrient intake by the middle aged women revealed that the diet was inadequate in calories, protein, calcium, iron, vitamin-A, vitamin-C and thiamin.

Thus from the results obtained in the present study, it came to assume that low nutrient intake was the reason for the prevalence of the various nutrition related deficiency symptoms especially micronutrient malnutrition among the subjects. The result strongly recommended for a higher intake of micronutrient rich foods.

5.7.2 Anthropometric Profile

Diet has been acclaimed to be one of the primary factors that help to promote growth and maintain life. The adequacy of diet consumed by the subjects can also be estimated through their anthropometric profile. Persons receiving good food and who are maintaining optimal dietary habits are expected to maintain the structure, form and composition of the body, even while ageing. ICMR (1994) reported that in field studies to assess nutritional status heavy reliance must be placed in the measurement of external morphology of the body. Hence the health and nutritional status of the subjects were ascertained through the anthropometric measurements such as height, weight, mid upper arm circumference, skin fold thickness, waist circumference and hip circumference.

Weight and height measured periodically are simple and useful indicators of body composition. From the weight and height of the subjects it was noticed that majority of them are having a weight below 50Kg and height below 155cm, which are considered to be standard. The subjects had a mean weight of 47 Kg and mean height of 150.5cm which formed 94.00 per cent and 97.10 per cent of standard weight and height respectively. Nutritional deprivation in early childhood, adolescence and early adult might have resulted in the failure to achieve full growth potential among the subjects.

Body height and weight are subjected to genetic influence but weight is also influenced by the balance between energy intake and expenditure. Present

study revealed a highly positive significant correlation between weight and energy intake (r = 0.6923) and energy expenditure (r = 0.5471). A highly positive significant correlation was also found between the age of the subjects and their weight (r = 0.3953). It was observed that as age increased, weight was also found to be increased among middle aged women. Anselmo *et al.* (1992) reported that aging seemed to be associated with increase in weight.

Body Mass Index (BMI) expressed as ratio of weight to height square (Wt/Ht^2) was used as a parameter for detecting Chronic Energy Deficiency (CED) and obesity. The details of BMI showed that majority of the subjects were having a normal BMI between 20-25.

Mid Upper Arm Circumference (MUAC) of the subjects revealed that majority of them were having a MUAC below the standard value of 28.5cm, while 5.33 per cent were having a MUAC level above the standard showing obese nature. A report published by NNMB (1991) has revealed that the MUAC of adult women in Kerala ranged from 24.00 to 27.40 cm. The MUAC of the subjects were in tune with the state level values.

Measurement of skin fold thickness gives an indication of how much energy resources are available in the body. The skin fold thickness showed that only 14.00 per cent of the subjects are having a normal value of 15.0 – 16.50 mm, whereas 7.33 per cent were having a skin fold thickness above standard and 8.67 per cent below 9.9mm.

Crofit et al., (1995) reviewed that waist to hip circumference ratio is a better predictor of obesity than BMI. Waist Hip Ratio (WHR) of the subjects showed that 56.67 per cent were having a normal WHR, whereas 35.00 per cent were having abdominal obesity. From the above data it is alarming to note that 8.33 per cent of the subjects is having a WHR above 0.9 which is reported to be of greater risk. Jain and Singh (2003) reported that WHR is a sensitive indicator to assess the risk of developing various degenerative diseases. WHO (2000) in their

technical report also pointed out that men with WHR above 1.0 and women with WHR above 0.85 are at risk.

Obesity could be attributed to hereditary characters or due to poor diet. Abdominal obesity should be considered as health risks since, increased incidence of cardiovascular diseases among middle aged population has become a factor of concern for the health professionals and planners as there has been a noted escalation in the incidence of the metabolic disorders even among people belonging to low socio-economic brackets, who have low body weight and lessened intake of calorie and other nutrients. Under this circumstance the elevated level of obesity observed among these BPL middle aged women need to be examined critically, since there is scientific evidence proving its association with cardiovascular diseases. The result of the study is in tune with the trend observed by Luni (2004) among women aged 40-75 years, where 40.00 per cent of the subjects had WHR values above 0.85.

Malnutrition results from the interaction between poor diet and disease and leads to most of the anthropometric deficits (WHO, 1997). The overall anthropometric data reveals the fact that middle aged women living below poverty line had poor body parameters compared to the normal standards. Based on the anthropometric measurements, the nutritional status of majority of the women presents a grim picture and efforts are needed to be initiated to elevate their nutritional status, by planning and implementing effective health and nutrition intervention programmes.

5. 7. 3 Clinical Status

Consumption of nutritionally inadequate diet resulted in signs of nutritional deficiencies. The clinical status of the subjects was evaluated through clinical examination. General appearance of 31.00 per cent of the subjects was found to be poor from a clinical point of view. Vitamin A deficiency affecting the conjunctiva, cornea, eyelids, skin and hair were observed in 12.00 per cent of the

subjects. The main reason for the presence of vitamin A deficiency observed among the subjects could be their poor dietary intake of vitamin A or its precursor (β- carotene) rich foods. It has been revealed that the diets consumed by the women were poor as they contained lesser amount of vitamin A & β- carotene rich protective foods especially animal foods like eggs, milk, liver, butter etc and plant foods like green leafy vegetables, dried and yellow fruits. Bamji *et al.* (2003) reported that low purchasing power of the communities and their inability to meet the dietary requirements even after spending 80-90% of their income on food is an important factor for the wide spread prevalence of vitamin A deficiency especially among women in low socio economic families.

Iron deficiency anaemia is always found to be associated with weakness, fatigue and exhaustion.(Viteri, 1997) Iron deficiency signs, such as pale coloured, tongue, pale conjunctiva, pale look and pallor of nails were observed among 65.00 per cent of population. While examining the food consumption pattern, it was found that the consumption of iron and vitamin – C rich foods were less among the subjects, which could lead to anaemia.

Vitamin – B complex deficiency symptoms such as angular stomatitis, nasolabial seborrhea, and reddish tongue are found among 28.00 per cent of the subjects. In a cereal based diet, riboflavin is found to be the most limiting nutrient (Bamji, 2003). Intake of cereals is found to be predominant in the diets of these respondents also. Vitamin – C deficiency such as swollen or spongy bleeding gums was found among 8.67 per cent of the subjects which is well noticed by the poor dietary intake of vitamin C. These deficiencies can be attributed to poor consumption of vegetables and fruits which are rich source of vitamin C.

Iodine deficiency symptom like thyroid enlargement was observed among 6.00 per cent of the subjects which is attributed also due to the lower intake of iodine rich foods.

Slight to marked amounts of dental caries were observed among 86.00 per cent of the subjects. Faina and Oberg (1995) observed that dental caries were most

commonly caused by bacterial infection. It could be said that poor oral hygiene also produce dental caries.

From the clinical study conducted, it may be concluded that dietary disorders superimposed by poor socio-economic conditions are prevalent to a high degree, and they in turn influence the health and nutritional status of these women in a negative manner. It was found that anaemia, vitamin – A deficiency disorders, iodine deficiency, B-vitamin deficiency and dental caries are seen among the subjects surveyed. Measures should be taken to prevent deficiency diseases among middle aged women, by providing an adequate diet or by the use of supplements, as nutritional deficiencies are more common among this group.

5.7.4 Haemoglobin Level

Haemoglobin level is another indicator of an individual health and nutritional status. Here it was observed that the subjects have a haemoglobin level lower than the standard level recommended by WHO. It was observed that 66.00 per cent of subjects were having a haemoglobin level below 12g/dl. Dietary inadequacy of iron and vitamin–C rich foods coupled with parasitic infections is often major epidemiological determinants of poor haemoglobin level among the subjects. Nutrient composition of the diets also revealed the insufficiency of iron rich foods quantitatively and qualitatively, which superimposed into the development of anemia which is indicative to a lower haemoglobin level.

5.8 ENERGY BALANCE STUDIES

Studies dealing with the relationship between women's workload and nutritional status have most often been examined as to know how it influences their health status. According to Daltabuit (1991) the nutritional and medical professionals have been more interested in women's nutrition from the point of view of child bearing and lactation, rather than in the health of the women for their own sake. Mahtab (1991) reported that in rural areas women do several

tasks simultaneously, some close to their homes and some further away from home, which needs more energy. Jain and Singh (2003) observed that an individual's occupation have a significant effect on the types of food consumed and hence on their nutritional status and physical activity.

Hence an attempt was made to assess their energy balance. The daily time utilization pattern and workload of the subjects with respect to their home and work site activities in 24 hours was observed, so that the influence of their work load in relation to their energy balance and nutritional status could be assessed. The time allocation pattern of the subjects revealed that they spend a major part of their day at house hold activities and at worksite. The results revealed that the subjects reportedly spend major part of their time at home for preparing food for the family members, and as a result they get only a little proportion of time for leisure and sleep. The above fact itself is an indication to the long hours of work they have to tread through the day. Majority of the subjects fetch water from outside for satisfying the needs of the family members, including washing of clothes and personnel needs. This shows that the subjects generally utilize a major per cent of the time and labour input in doing activities at home and outside. The dual stress of work inside and outside the home could have an adverse effect on their nutritional status. Based on their work pattern they are categorized as moderate workers.

The total energy expenditure of the subjects for a day, for fulfilling all their duties were calculated since, dietary factors and physical activity patterns strongly influence the energy balance and can be considered to be the major modifiable factor (Jain and Singh, 2003). The ICMR (1999) has specified a RDA of 2225 K cals for an adult women doing moderate activity. In the present study it was observed that the subjects spend more energy than the RDA. Work demands extra energy which varies according to the type of activity and the subjects were observed to have a mean energy expenditure of 2563.00 K cals. The mean energy intake when computed from the 24 hour recall diet survey pointed out an intake of only 2218.00 K cals, which indicates a deficit of 7.00 K

cals from their RDA. Energy adequacy was observed to satisfy only 98.40 per cent of their RDA. A negative energy balance of 345 K cals was obtained when the mean energy intake of 2218.00 K cals compared with their energy expenditure of 2563.00 Kcals/ day. This clearly indicates that there is an energy gap, which occurred from high expenditure of energy compared to their low dietary energy intake, which could leads them in wasting of muscles, which is indicated by their poor body weight.

The negative energy balance and the consequent low body weight observed among the middle aged women could be attributed to an inter play of several factors. Primarily it could be due to low food intake in terms of poor calorie density or it, could be due to the heavy work load, lack of leisure time and stress which might have led to draining of energy resources with consequent lowering of body weight.

5.9 NUTRITIONAL STATUS INDEX (NSI)

Nutritional status is an indicator of social well being of a community influenced by factors such as physiological, socio- cultural and psychological influence such as thoughts, beliefs and emotions (Otteson *et al*, 1989). Nutritional Status Index of 300 middle aged women were developed using selected indicators viz height, weight, waist circumference, waist hip circumference, skin fold thickness, mid upper arm circumference, and haemoglobin level. The mean NSI value for the 300 middle aged women was 611.60, where 61.00 per cent had lowest NSI, 30 per cent medium level and 9.00 per cent high level category. The 60.00 per cent having low nutritional status is indicative of the poor nutritional status of the middle aged below poverty line women.

The macro sample study from various methods of assessment brings out that the subjects do not project a good nutritional status. Earlier studies showed that poor dietary intake of micronutrient rich foods, along with poor bioavailability is the main reason for the occurrence of micronutrient deficiency disease among middle aged women.

Nutritional status evaluation done in the macrosample of 300 middle aged women had revealed the fact that the nutrients and food intake of the subjects were inadequate to meet their daily recommended allowance.

Micronutrient deficiency diseases mainly, iron deficiency, vitamin-A deficiency and iodine deficiency disorders are of greatest public health concern among all age groups including middle aged women. Hence in depth study (n = 30) was conducted to assess the micronutrient profile of the subjects. Based on the nutritional status index developed from the macrosample, 15 women having highest NSI and 15 women of lowest NSI were selected to study the micronutrient profile of the subjects.

5.10 ACTUAL NUTRIENT INTAKE (WEIGHMENT METHOD)

Lathem (1997) pointed out that the only way to assess the diet actually consumed is to weigh and measure all the food that individuals eat over a representative period of time. A single day food weighment survey was resorted to assess the dietary micronutrients of the subjects. Actual amount of nutrients consumed by these 30 women were estimated for β-carotene, iron, iodine, protein, calcium, fibre, and vitamin-C.*

The mean intake of nutrients for β- carotene, iron, iodine, calcium, vitamin-C, fiber and protein were comparatively higher for the high index group, whereas no significant difference was found between the two groups. Dietary intake of β- carotene was found below RDA in both the groups. The diets in general are found to be lacking in β –carotene rich foods like green leafy vegetables, fruits and milk.

Iron consumed in the diet was found to satisfy only 42.28 per cent of the RDA for low NSI group and 48.57 per cent for high index group. The intake of dietary iodine was also below the RDA. Raman and Sharma (2003) stated that in adult man and women, anaemia due to poor dietary iron intake results in poor work out put since, work capacity is reduced considerably due to muscle fatigue

which has great adverse effect on productivity in the industrial and agricultural sectors.

The adequacy of protein and calcium in the diet were found below the RDA stipulated. WHO (1995) reported that in most countries middle aged women often consume lower quality protein. Deshpande *et al.* (2001) in his study among adult women showed that, besides the poor qualitative protein intake the quantity of protein was also inferior, as most of the protein in the diet comes from cereals and pulses. Singh *et al.* (1998) reported that poor calcium absorption, low dietary calcium and minerals are the main reason for osteoporosis in middle aged women. Elu *et al.* (2000) also reported that intake of calcium was very low among middle aged women in Tanzania. Rahman (2000) reported that calcium intake of Pakistani middle aged women is also low with 330mg against RDA of 400mg. In the present study the low intake of green leafy vegetables fruits and animal products might be the reason for low calcium content in the diet.

The intake of vitamin-C and fiber was also found below the RDA. The diet in generals was found to be lacking in vitamin – C and fiber rich foods like, fruits, and vegetables.

Thus it could be concluded that adequacy of nutrients in the diet consumed by the subjects were inadequate with respective to their RDA irrespective of their nutritional status.

5.11 MICRONUTRIENT PROFILE

Ramakrishnan (2002) reported that micronutrients deficiencies are common in many developing countries and are typically due to inadequate food intake, poor dietary quality, poor bioavailability and /or the presence of infections. Middle aged women are the stakeholder that has not been a target of nutritional intervention programmes. Poor nutrition at home and no supplementation at community levels make this group more vulnerable to micro nutrient deficiencies.

In this study to assess the micronutrient profile of the subjects, food and serum were collected from the subjects to see the bioavailability of the most important micronutrients *viz.*, β- carotene, iron and iodine. In case of iodine, urinary iodine was subtracted from dietary iodine to see the bioavailable iodine.

Carotenoids are natural pigments which are synthesized by plants and are responsible for the bright colour of various fruits and vegetables. Analysis of the β- carotene contents in the diet showed that both the subjects with low and high NSI have no significant difference, however the values for high NSI was higher than low NSI group. Rock *et al.* (1998) reported that bioavailability of β-carotene from meals is influenced by a number of factors like carotenoid content, the manner in which food are processed and cooked as well as the content of the lipids and fiber in the meal. He also reported that routine consumption of green leafy and yellow fruits produced an increase in plasma, β- carotene concentration than associated with the consumption of same amount of β- carotene from same vegetable.

β-carotene bioavailability has been generally assessed by monitoring the plasma β -carotene, following the ingestion of either purified β - carotene or a β - carotene rich meal (Oshima *et al.*, 1997).

As far as the serum values for β- carotene was concerned it ranged from 42.23 to 139.90 μg/ 100 ml, showing a deficit from the normal value of 40 – 250 μg /100 ml .The low serum values may be attributed due to the lower consumption of β- carotene rich foods especially green leafy and yellow fruits. The presence of clinical manifestation of vitamin A deficiency observed among the subjects also confirmed the lower serum β- carotene level.

ACC / SCN (2000) reported that iron deficiency anaemia is by far the most wide spread nutrient deficiency in the world, affecting more than two billion persons. Lawrence (2001) had stated that the group most likely to have iron deficiency are young children, teenagers, pregnant women and both men and women over 50 years. In the present study also dietary iron intake of the subjects

shows an insufficient consumption, with regard to the RDA of 30mg/day. No significant difference was found between the low and high index groups. Zimmermann *et al.* (2005) reported that in many developing countries, cereal and legume based diets contain lower amounts of bioavailable iron, which may increase the risk of iron deficiency. A study conducted by Hurrell (2004) among middle aged women in Nigeria showed a mean dietary intake of 12.83 mg /d, of which 97.00 per cent was nonheme iron. Raman and Sarma (2003) reported that availability of iron from a diet is related to calorie intake, ascorbic acid, calcium and protein, while the presence of phytates and tannins present in plant foods inhibit iron bioavilability. Bioavilability of iron from the diet was also noted to be very low with a mean of 0.48 mg / day and 0.53 mg / day for low and high NSI groups respectively. Dietary bioavailability of iron from the diet was only 3.7 per cent. ICMR (2001) pointed out that Indian dietaries are reported to be non-heme with low bioavailability. The low bioavailability may be due to the low availability of vitamin C and heme iron in the diet. Food use frequency of micronutrients rich food also received a least score. Serum iron level of the subjects was markly below the normal level of 50 - 175 mg / dl.

Perez *et al.* (1980) reported that prevalence of goiter is generally more among females than males. WHO (1996) noted that goiter due to iodine deficiency in diet is three times greater in middle aged women than in males. In the present study dietary adequacy of iodine shows a range between 75.51 – 156.20 µg / d. However none was found to have dietary iodine content below 75.00 µg /d. The considerable fair amount of iodine value in food may be due to the consumption of fish which is rich in iodine content.

The serum iodine content was 8.54 µg / dl for low NSI group and 9.79 µg / dl for high NSI group; where as increased bioavailability was found for high index group even though the increase was not significant.

Correlation studies carried out in general shows that a highly significant correlation was found between iron, β- carotene and vitamin C, showing the

mutual necessacity of these vitamins in the diet. Similar observations were cited by Blackley *et al. (1991)* that vitamin- A is involved in the regulation of iron transport from the liver. He also stated that bioavailability of non heme iron present in vegetarian diets could be improved in the presence of vitamin-A and vitamin- C.

According to Martin *et al.* (2000) vitamin-A deficiency subjects showed a reduction in haemopoietic cells in the bone marrow and have evidenced haemosidaerosis in the liver and spleen. Majia and Arroyave (1982) also reported that vitamin-A deficiency and aneamia is often co-exist and there are significant association between serum retinol and bio chemical indicators of iron status. Annet *et al.* (1995) reported that how ever the mechanism by which vitamin-A influences iron metabolisum are still unknown. It should be noted that in the present study the vitamin-A/ β-carotene consumption was low.

There are many reports which indicate the close association of vitamin-C in iron bioavailability. According to Hallberg (1981) ascorbic acid has a close relation, enhancing effect on non-heam iron absorption. He reported that a dose of 25 mg of vitamin- C taken together with a semisynthetic meal is found to increase the absorption of iron to 65 per cent and 1g dose resulted in nine fold increase in absorption. How ever Cook *et al.* (1991) also observed in a two year study among adult volunteers, when large dose of ascorbic acid in meal had no effect on serum ferritins probably because of inhibitory factors.

The haemoglobin level of the subjects was found to be positively correlated with the serum β -carotene and serum iron. Studies conducted by Hamberg *et al.* (2004) established that vitamin – A supplementation improved the haemoglobin level by facilitating a better utilization of iron. Suhano *et al.* (1993) reported that in a vitamin-A deficiency endemic area a direct association between vitamin- A supplementation and increased blood haemoglobin levels observed.

From the various methods of assessment it was cleared that the subjects understudy do not project a good nutritional status. The sample showed deficit in

anthropometric measurements with poor heamoglobin level and possessing many of the nutritional deficiency symptoms and consumed a diet inadequate in quantity and quality. Micronutrient profile studies conducted among the population clearly indicated that dietary intake of all nutrients were below the recommended levels and found no significant difference between the high and low NSI groups within the below poverty level middle aged women. The result revealed that majority of the women did not possess normal values as far as the β-carotene, iron, and iodine were concerned. This leads to the confirmation that poor dietary micronutrient intake coupled with poor bioavailability with special reference to β- carotene, iron and iodine would have all contributed to the incidence of micronutrient deficiency diseases among middle aged women.

Summary

6. SUMMARY

The study entitled "Nutritional profile of middle aged women of Below Poverty Line (BPL) families with special reference to micronutrients" was carried out to ascertain the nutrition status of middle-aged women and to elicit information on the various factors, which may influence their nutrition and health status.

The study was conducted at two levels, on a macro samples of 300 middle aged Below Poverty Line (BPL) women and on a micro sample of 30 women based on the computed Nutritional Status Index (NSI). The nutritional status was evaluated through multiple channels involving, socio-economic, dietary intake, anthropometry, clinical, health and reproductive history, haemoglobin, stress and strain and energy balance on macro samples. The micronutrient profile was also studied on the sub samples.

The socio-economic survey revealed that 82.00 per cent of the subjects belonged to Hindu community and nuclear type families were found to be more popular in the areas surveyed. It was found that adult population contributed 59.40 per cent, while child population was low when compared to adults. Families studied had comparatively more number of females than males with a sex ratio of 1000: 1083. Another interesting feature was the high educational status of females compared to males. Employment status of the population showed that 28.40 per cent of male and 69.60 per cent of females were unemployed. Distribution of families with respect to number of persons employed per house revealed that 20.00 per cent of families were having only one employed member, whereas the rest were having more than one employed member.

Details related to the most important economic problems ranked on a priority basis showed that of the various economic problems listed, lack

of permanent employment was the most important problem they faced. Socio-economic survey carried out revealed that presence of an alcoholic, drug addict, family belonging to scheduled caste, family with one of no adult employed, family with no access to safe drinking water were the four major risk factors identified on priority basis.

Age wise distribution of the subjects showed a gradual increase in number of women, when the age increases from 40-55 years. Marital status showed that 99.00 per cent were married, while widows constituted 19.00 per cent of the population. Educational status of the women showed that 8.33 per cent were illiterates. In the present study 50.67 per cent of middle aged women were employed. Income status showed that none were earning above Rs. 1,500/-. Regarding the participation of middle aged women in social / voluntary activities, 79.33 per cent were engaged in activities as members whereas 12.00 per cent as active members. Health problems when enumerated in general revealed the fact that skin diseases followed by arthritis, osteoporosis, diabetes mellitus and hypertension were prevalent among the subjects. Reproductive health problems mainly repeated abortions, irregular menstruation, uterine problems and problems associated with menopause were noticed among the subjects under study. Study revealed that 59.67 per cent of the subjects were suffering from severe stress and strain.

Food habits revealed that all the 300 (100.00 per cent) subjects were non-vegetarians. Food expenditure pattern for various consumables revealed that families food expenditure was mainly for the purchase of cereals followed by fish, food outside home, milk and milk products, nuts and oil seeds, other vegetables, roots and tubers. It was also revealed that 75.00 per cent of families income was spent for the purchase of food items. Energy rich foods were used daily, whereas protective and body building foods were rarely used by the subjects. Low intake of

micronutrients rich foods especially green leafy vegetables, fruits and animal foods were also observed.

Dietary intake of all food items was marginally lower than their respective RDA except roots and tubers. Assessment of the nutrient intake revealed that the diet was inadequate in calories, protein, calcium, iron, vitamin-C, vitamin – A and thiamine.

The mean anthropometric measurements of the subjects revealed that the mean weight to be 47.00 kg and height 150.40cm. The results on weight and height were used to compute the Body Mass Index (BMI) of women, and the mean BMI was 20.90. Body Mass Index of majority of the subjects were having a normal BMI 20-25, whereas Grade I and Grade II obesity were detected in 14.00 and 2.67 per cent of population. Mid Upper Arm Circumference was 22.50, while mean Skin Fold Thickness was observed as 12.40mm. The mean Waist and Hip Circumference were found to be 69.44cm and 82.65cm respectively and the Waist Hip Ratio was 0.84Severe energy deficiency was seen among 4.00 per cent of women, whereas none was observed to be having Grade III obesity. 8.33 per cent of the subjects were having a waist hip ratio above 0.9 which is reported to be risky.

Clinical status of the subjects was assessed by a trained clinical practitioner using the standardized schedule of (WHO,1997) Iron deficiency signs, such as pale coloured tongue, pale conjunctiva, pale look and pallor of nails were observed among 65.00 per cent of population. Vitamin A deficiency was observed in 12.00 per cent of the subjects. Vitamin B complex deficiency symptoms such as angular stomatitis, nasolabial seborrhea and reddish tongue were found among 28.00 per cent of the subjects. Vitamin C deficiency such as swollen or spongy bleeding gums was found among 8.67 per cent of the subjects. Iodine deficiency symptom like thyroid enlargement was observed among 6.00 per cent of the subjects. Biochemical tests showed that 66.00 per cent of the subjects

were having haemoglobin level below 12 g/dl, which is an indicative of anaemia.

A negative energy balance was observed when the mean energy intake of 2218.00 K cals compared with the energy expenditure of 2563.00 K cals, which could lead them in wasting of muscles. Only 98.40 per cent of energy was met, when compared with RDA of 2225 K cals.

Based on these data the Nutritional Status Index was developed. It was observed that 61.00 per cent of the subjects were having a low NSI, which is indicative of the poor nutritional status of middle aged BPL women. 30.00 per cent were in medium level category and 9.00 per cent were identified under high level NSI category. Based on the Nutritional Status Index developed from the macrosample, 15 women having highest NSI and 15 women with lowest NSI were selected to study the micronutrient profile of the subjects. Detailed biochemical investigation was carried out to assess the bioavailable β- carotene iron and iodine in food and blood drawn from the selected microsamples. In case of iodine urinary iodine was subtracted from the dietary iodine to assess the bio-available serum iodine.

Indepth study revealed that adequacy of nutrients in the diet consumed by the subjects were inadequate with respect to their RDA, irrespective of low and high nutritional status. Analysis of the β-carotene content in the diet showed that both the subjects with low and high NSI have no significant difference, however the values for high NSI was higher than low NSI groups. The mean dietary intake of β- carotene for women having low and high NSI was 643.88 μ g/day and 645.86 μ g/day respectively. Bioavailability of dietary β- carotene of the subjects showed a mean of 110.37 μ g/ day and 113.80 μ g/ day for low and high group respectively. The serum β- carotene levels ranged from 42.23 to 139.90 μ g/ dl among the sample population. Bioavailability of β-carotene from the

diet was found to be only 17.62 per cent for high index and 17.14 for low index groups.

In the present study dietary intake of iron by the subjects showed an insufficient consumption, with regard to the RDA of 30 mg/day. Mean dietary iron was found to be 12.68 mg /day and 14.57 mg/ day for low and high NSI groups respectively. Bioavailability of iron from the diet was also noted to be very low with a mean of 0.48 mg/day and 0.53 mg/day for low and high NSI groups respectively. Serum iron seems to be in the range of 14.79 mg / dl to 70.62 mg / dl with a mean of 52.81 mg / dl for low NSI and 57.46 mg / dl for high NSI groups.

Dietary adequacy of iodine revealed a range between 75.51 – 156.20 µg/d. None was found to be having dietary iodine content below 75.00 µg/d, which was considered to be safe. Urinary iodine was found to range from 67.76 µ g/ L to 146.48 µ g/ L, with a mean value of 111.35 µ g /L for low index group and 113.40 µ g/ L for high index group. However 26.67 per cent of the subjects were found to have mild urinary iodine deficiency with a urinary iodine value between 50.00-99.90 µ g/ L. The serum iodine content was 8.54 µg/d for low NSI group and 9.79 µg/d for high NSI group. However 36.67 percent of women were having serum iodine value below 8.00 µ g/dl. Increased bioavailability was found for high index group even though the increase was not significant.

Correlation studies carried out showed that a highly significant correlation was present between iron, β-carotene and vitamin C, showing the mutual necessity of these vitamins in the diet. The haemoglobin level of the subjects was found to be positively correlated with the serum β-carotene and serum iron.

From the various methods of assessment it was cleared that the subjects under study do not project a good nutritional status. The subjects showed deficit in most of the anthropometric measurements with poor

haemoglobin level and having many of the nutritional deficiency symptoms. They consume a diet inadequate in quantity and quality of nutrients. Micronutrients profile studies conducted among the population clearly indicated that dietary intake of all nutrients was below the recommended levels especially micronutrients. No significant difference was found between the high and low NSI groups within the women as far as micronutrients were concerned. The result revealed that majority of the women did not possess normal values, as far as the β-carotene, iron and iodine were concerned. This leads to the confirmation that poor dietary micronutrients intake coupled with poor bioavailability with special reference to β-carotene, iron and iodine would have all contributed to the high incidence of micronutrients deficiency diseases among middle aged women.

The findings provide baseline information for developing nutritional intervention programs for middle-aged women. Based on the findings the following recommendations have been brought out.

- Research study can be conducted to see the influence of diet in degenerative diseases among middle-aged women.
- A comparative research study can be conducted between middle-aged women in high and low economic strata.
- Nutritional profile of middle-aged women with special reference to macro nutrients could be studied.
- RDA for middle-aged women could be developed.

References

7. REFERENCES

Abid, M., Billington, C.J. and Nuttall, F.Q. 1999. Thyroid function and energy intake during weight gain following treatment of hyperthyroidism. *J. Am. Coll. Nutr.* 18: 189-193

*ACC/SCN. 2000. *Women and Poverty*. Nutrition Policy Discussion Paper No. 42. United Nations, Geneva, p. 783

Alexander, N.E., Ross, J., Littenberg, B. and Nease, R.F. 1998. Under nutrition and major diseases in middle aged and older women. *J. Gen. Int. Med.* 15: 108-210

Allen, L.H. 2000. Dietary intake of women in Scotland. *Nutr. Rev.* 51: 49-52

Andres, R.G., Mary, G., Garry, P. and Muin, D. 1994. Ageing, health and the family. *J. Am. Dietet. Ass.* 29: 120-132

Annet, J.C.R., Clive, E.W., Robert, H. and Anton, C.B. 1995. Evaluation of a two generation rat model for vitamin A deficiency and the interrelationship with iron metabolism. *Brit. J. Nutr.* 74: 689-700

*Anselmo, M.A., Burini, R.C., Angeleli, A.Y. and Mota, N.G. 1992. Evaluation of nutritional status of adult middle class healthy subjects – Energy and Protein Intake anthropometry, blood biochemical diets and immunocompetence tests. *Revista de Saute Publica.* 26: 46-53

Antony, R. and Chatterjee, M. 1999. *Wasting Away the Crisis of Malnutrition in India.* The World Bank, Washington, p. 125

Arora, H. 1991. *The Women Elite in India.* Sangam Books Limited, London, p. 258

Australian Bureau of Statistics. 1998. National nutrition survey: nutrient intakes and physical measurements. *AGPS.* 12: 1078

*Avis, N.E., Legato, M.J., Padus, E. and Bastani, R. 2000. Women's perceptions of their health and nutrition with special reference to protein energy malnutrition. *Am. J. Pre. Med.* 17: 157-169

Baker, A. 1999. Changes in energy balance and obesity among women in Hawaii coasts. *Int. J. Eat. Disord.* 24: 287-293

Bamji, S.M., Rao, P.N. and Reddy, V. 2003. *Textbook on Human Nutrition.* Second edition. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, p. 507

Barker, D.J.P. 1998 . *In vitro* programming of chronic disease. *Clin. Sci.* 95: 115-128

Begum, R. 1991. *A Text Book of Food Nutrition and Dietetics.* Sterling Publishers, New Delhi, p. 210

Bentley, M.E. and Griffiths, P.L. 2003. The burden of anemia among women in India. *Eur. J. Clin. Nutr.* 57: 52-60

Bhaskaram, P. and Krishnaswamy, K. 2003. Trace elements of clinical significance – zinc and selenium. *Textbook of Human Nutrition* (eds. Bamji, M.S., Rao, N.P. and Reddy, V.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, pp. 330-340

Blackley, S.K., Michell, T., Jenkins, M.V. and White, G.E. 1991. Canthaxanthin and excess vitamin-A alter, X-tocopherol carotenoid and iron status in adult rats. *J. Nutr.* 121: 1649-1655

Boora, P., Khetappaul, N. and Kapoor, A.C. 1999. A study of prevalence and awareness about goiter among preadolecent of Haryana. *J. Dairying Fd Home Sci.* 18: 71-77

Bothwell, T.H., Charlton, R.W., Cook, J.D. and Finch, C.A. 1989. A comparative study on the dietary intake of vegetables on different women groups. *JAMA*. 279: 372-390

Brahmam, G.N.V. 2003. Iodine deficiency disorders. *Textbook of Human Nutrition* (eds. Bamji, M.S., Rao, P.N. and Reddy, V.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, pp. 291-300

Bray, G.A. 1991. Pathophysiology of obesity. *Am. J. Clin. Nutr.* 55: 448-494

Brownlee, M. 1996. Diabetes type 2 – Associated diseases. *Clin. Invest. Med.* 18: 332-339

Burns, S.M. 2000. Changes in energy balance and body composition at menopause : a controlled longitudinal study. *Ann. Intern. Med.* 142: 571-589

Calloway, Z. 2001. The nutritional status of Nuxall non-Pregnant non-lactating women of Bella Coola British Colombia. *J. Ethnobiol.* 12: 68-75

*Campbell, M.L., Diamant, R.M.F., Grunau, M. and Halladay, J. 1999. Energy and nutrient intakes of men (40-60 years) and women (35-55 years) in three northern Manitoba Cree Communities. *J. Can. Diet. Ass.* 66: 173-188

Champion, S.K. 2000. Women's Health Research: a Medical and Policy Primer. Second edition. Health Press International, Washington, p. 322

Chandha, S.L., Gopinath, N., Katyal, I. and Shekhawat, S. 1995. Dietary profile of adults in an urban and a rural community. *Indian J. Med. Res.* 101: 258-267

Colins, T.W. 2005. Barriers to cancer screening. *J. Behavioural Med.* 32: 332-343

Cook, J.B., Dassenko, S.A. and Lynch, S.R. 1991. Assessment of the role of non-hemeiron availability in iron balance. *Am. J. Clin. Nutr.* 54: 714-722

Crofit, J.R., Neenan, N.L., Sheriden, D.P., Wheeler, F.C. and Speers, M.A. 1995. Waist hip ratio in biracial population measurement implications and cautions for using guidelines to define high risk for cardiovascular diseases. *J. Am. Diet. Ass.* 95: 1-5

Dacia, J.V. and Lewis, S.M. 1984. *Practical Haematology*. Sixth edition. Churchill Livingstone, Edinburgh, p. 402

Davy, K.P., Evans, S.L. and Stevenson, E.T. 1996. Adiposity and regional body fat distribution in physically active young and middle aged women. *Int. J. Obese Relat. Metab. Disord.* 20: 777-783

Deltabuit, M. 1991. Mayan Women: Work Nutrition and Child Care. *Rur. Dev. Abst.* 14: 36

Deshpande, S.S., Misra, A. and Misra, M. 2001. A study of dietary intake by farm women in Bhopal district of Madhya Pradesh. *Indian J. Nutr. Dietet.* 20: 22-29

Devadas, P.R. 1991. Nutritional and social consequences of poverty. *Res. High.* 2: 1-9

Devish. 2001. Relation of body mass index in young adulthood and middle age to medicare expenditure in older age. *JAMA* 272: 2743-2749

Dhanasekharan, K. 1991. Socio-economic measures of quality rural life : An alternative approach for measuring rural poverty. *Indian J. agric. Econ.* 46: 34-46

Health Report. 2001. *Health Status* .Department Of Health Service. Government of Kerala, p. 198

Economic Review. 2003a. *Poverty and Special Programmes for Weaker Sections*. Government of Kerala State Planning Board, Thiruvananthapuram, p. 466

Economic Review. 2003b. *Labour and Employment*. Government of Kerala State Planning Board, Thiruvananthapuram, p. 466

Economic Review. 2003c. *Gender and Development*. Government of Kerala State Planning Board, Thiruvananthapuram, p. 466

Eyan, C.L. 2000. The effects of aerobic exercise on plasma catecholamines and blood pressure in patients with mild hypertension. *JAMA* 261: 2609-2613

Edben, R.V. 2000. Bone mineral density and dietary factors among older women. *Ecol. Fd Nutr.* 44: 289-295

Elu, H.M., Lipter, J.H., Paul, K.J. and Wallace, E.S.P. 2000. Traditional wild foods in Tanzania. *S. Afr. Med. J.* 14: 158-167

Faina, M.P. and Oberg, D. 1995. Survey of dental nutrition knowledge of WIC nutritionists and public health dental hygienists. *J. Am. Dietet. Ass.* 2:190-194

Felsy, T.F. 1989. Nutritional profile of Kanikkar women in Amboori area. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 161

*Finch, S., Bates, C.J. and Prentice, A. 1999. Gender difference in food and nutrient intakes and status indices from the National Diet and Nutrition Survey of people aged 40 years and Over. *Euro. J. Clin. Nutr.* 53: 694-699

Franklin, D.S., Laren, S., Stew, M.T. and Shils, G.S. 1991. Goitre prophylaxis programmes and its effects in Tanzanian middle aged women. *J. Vita. Res.* 23: 79-85

Fullerton, R.J. 2001. The prevalence of impaired glucose tolerance and diabetes mellitus in women aged 20-44 years in South Canada. *J. Am. Diet. Ass.* 81: 373-381

Garrav, G.A. 2002. Osteoporosis, diagnosis and prevention. *Nurse. Pract.* 39: 120-137

Garrett, D.A., Failla, M.L., Sarma, R.F., Craft, N.E. 1999. Accumulation and retention of micellar beta-carotene and lutein by $CaCO_2$ human intestinal cells. *J. Nutr. Biochem.* 10: 576-581

Garrow, M.E. 2002. Body weight pre-occupation in middle age and ageing women : A general population survey. *Int. J. Eat. Disord.* 23: 287

George, S. 2002. Impact of spirulina food supplement on pre-malignant conditions in women. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 168

Gomez, M. 1990. Degenerative diseases found among elderly. *Nutr. Rev.* 32: 28-30

Gopalan, H.N.B. and Sumeet, S. 1999. *Women Health and Environment – An Anthology.* Replika Press Pvt. Ltd., New Delhi, p. 206

Government of India. 2001. *Ninth Five Year Plan* . Planning Commission, New Delhi, p. 560

Government of Kerala. 1991. *BPL Census Survey List – 1991.* Department of Economics and Statistics, Thiruvananthapuram, p.1003

Government of Kerala. 2001. *Census at a Glance.* Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram, p. 112

Grazian, F. 1999. Calcium not only key to bone health. *Clin. Invest. Med.* 24: 281-294

Gregory, F. 2000. The Dietary and Nutritional Survey of British adults. *Euro. J. Clin. Nutr.* 58: 332-352

Hallberg, L. 1981. Bioavailability of dietary iron in man. *Rev. Nutr.* 1: 123-147

Hamberg, K., Sumner, B., Lannin, D.R. and Ash, M.T.S. 2004. Micro minerals and population. *J. Fd. Nutr. Tech.* 78: 89-101

*Haris, A., Blazer, M. and Bella, C. 2004. Intake of trace elements and bone mineral density among women. *J. Vita. Res.* 49: 171-183

Hayes, P.N., Bathalon, G.P., Crory, M.A., Roubenoff, R., Lipman, R. and Roberts, S. 2002. Eating behaviour correlates of adult weight gain and obesity in healthy women aged 40-60. *Am. Soc. Clin. Nutr.* 75: 476-483

Helmick, M.S. 2002. Locomotor problems of women. *Prev. Med.* 39: 143-148

Henary, R.J. 1974. *Clinical Chemistry: Principles and Techniques.* Fifth edition. Harper and Row Publishers, Washington, p. 539

Huffman, S.L. 1999. Food intake of aged women in Caribbean coasts. *Am. J. Clin. Nutr.* 38: 184-193

Hunter, D.J. 1993. A prospective study of the intake of micronutrients among adult women. *N. Engl. J. Med.* 329: 234-240

Hurrel, R.F. 2004. Iron deficiency and related factors among older adults in Nigeria. *Am. J. Clin. Nutr.* 80: 98-107

ICMR. 1989. *Epidemiological Survey of Endemic Goitre and Cretinism: An ICMR Task Force Study.* Indian Council of Medical Research, New Delhi, p. 173

ICMR. 1994. *Report on Urban Survey-Slums 1993-94.* National Nutrition Monitoring Bureau, Hyderabad, p. 507

ICMR. 1999. *Nutritive Value of Indian Foods.* Third edition. Indian Council of Medical Research, New Delhi, p. 93

ICMR. 2001. Micronutrient deficiency disorders in 16 districts of India. Report of an ICMR task force study – District Nutrition Project. No. 1. Indian Council for Medical Research, New Delhi, p. 38

Indian Council of Medical Research. 1994. Nutrient Requirements and Recommended Allowances for Indians, ICMR, New Delhi, p. 23

Ingram, T., Volte, M.S., Neeld, J. and Torun, S. 2001. Intake of body building foods among in South Peruvian valleys. *J. Nutr. Educ.* 62: 281-297

Issac. 1990. Modernisation and employment : the coir industry in Kerala. *J. Rur. Dev.* 12: 120-121

*Ivanova, L., Pentieve, K., Petrova, S., Vatralova, K., Angelova, K., Pova, L.M. and Lancheva, M. 1995. The effect of the diet on the iron status and incidence of anaemia in pregnant women. *Akush. G. Inekol.* 34: 6-8

Jain, H. and Singh, N. 2003. A study on the nutritional status of women in the age group of 25-50 years working in sedentary job in Jaipur city. *Ind. J. Nutr. Diet.* 40: 91-98

James, W.P., Luizz, F. and Waterlow, J.C. 1988. Definition of chronic energy deficiency in adults. *Am. J. Clin. Nutr.* 42: 969-981

Janklin, W.M.B. 2001. A prospective study on socio-economic aspects of fracture of the proximal femur of middle aged women in Peru. *J. Bone. Mine. Res.* 11: 1935-1942

Jelliffee, D.B. 1966. The assessment of nutritional status of the community. Monograph Series No. 53. WHO Geneva, p. 188

Johns, T.S. 2001. Women's representation in the work force. Vikas Publishing House Pvt. Ltd., New Delhi, p. 233

Jyothi, A. 1993. Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional

status. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 178

Kamal, S. 2000. Dietary profile of goiter patients. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 134

Karuna, M.S. 1993. Nutritional status of women engaged in fish vending in Thiruvananthapuram district. Ph.D. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 165

Kaul, S.S. and Nyamongo, K.I. 1990. *Ecology, Growth and Nutrition Status*. Second edition. Ashish Publishing House, New Delhi, p. 320

Kavitha, M.S. 1999. Effect of iron and vitamin supplementation on iron profile of anemic adolescent girls. Ph.D. thesis, Kerala Agricultural University, Thrissur, p. 351

Kerala Statistical Institute. 2001. *Socio-economic Changes in Kerala – A Study Based on Selected Localities*. KSI, Thiruvananthapuram, p. 203

Kerala Women's Commission. 2003. *Status of Women in Kerala : A report based on Sample Studies*. Kerala Women's Commission, Thiruvananthapuram, p. 408

Kim, E.M. 2001. Life style diseases in the 21st century. *Arch. Phys. Med. Rehabil.* 93: 116-129

Krishna, S. 1988. Some observations on the food consumption pattern and nutritional status of marine fishermen community. *Marine Fisheries Information Service.* 80: 22-26

Krishnadev, T.M. 2002. Dietary intake of animal foods among older adults in Nepal. *J. Fd Comp. Anal.* 18: 48-54

Krishnaswamy, K. and Ghafoorunissa. 2003. Diet and coronary heart disease. *Textbook of Human Nutrition* (eds. Bamji, M.S., Rao,

P.N. and Reddy, V.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, pp. 239-350

Kruse, M.V. and Horsch, M.A. 1993. *Food, Nutrition and Diet Therapy.* Saunders Company, Philadelphia, p. 331

Kuhnlein, H.V. 1984. Traditional and contemporary Nuxalk foods. *Nutr. Res.* 4: 789-809

Kuhnlein, H.V. and Burgess, S. 2005. Improved retinal, carotene, ferritin and folate status in Nuxalk teenagers and adults after a health promotion programme. *J. Nutr. Educ.* 84: 127-133

Kumari, J.S. 1993. Food consumption pattern of selected farm families in Thiruvananthapuram district. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 157

Laisamma, C. 1992. Food consumption and energy expenditure pattern of agricultural labourers of Thiruvananthapuram district. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 155

Lathem, M.C. 1997. *Human Nutrition in the Developing World.* Second edition. Cornell University. Press, Rome, p. 500

Lawrence, R.W. 2001. The prevalence of anaemia among adults and older women in Suez. *Vit. Heal. Stat.* 16: 230-242

Lean, M.E.J., Han, T.S. and Morrison, C. E. 1995. Waist circumference as a measure for indicating need for weight management. *Brit. Med. J.* 11: 638-641

Lingsten, H.T. 2002. Educational inequality in the metabolic syndrome and coronary heart disease among middle aged women and aged women. *Int. J. Epidemiol.* 34: 327-331

Lipton, M. 1989. Attacking under nutrition and poverty. *Nat. Bank News Rev.* 5: 16

Luni, J.S.I. 2004. Primary prevention of coronary heart diseases in women.Oxford University Press,Washington, p.108

Mahtab, N. 1991. Health and nutrition of rural women in Bangladesh : the household interface. *Rur. Dev. Abst.* 14: 327

Majia, L.A. and Arroyave, G. 1982. The effect of vitamin A fortification of sugar on iron metabolism in pre-school children in Guatemala. *Am. J. Clin. Nutr.* 36: 87-93

Manson, S. and Swash, M. 1995. *Hutchison's Clinical Methods*. Second edition. Cassell Ltd., London, p. 150

Marcus, T.S. 1999. Energy balance of women doing heavy activities in agriculture. *J. Nutr.* 136: 213-216

Martin, W.B., Michael, W., Robert, J.E., Andries, J.P., Joap, S., Sastri, S. and Wil, H.P.S. 2000. Iron metabolism and vitamin A deficiency in children in Northeast Thailand. *Am. J. Clin. Nutr.* 50: 332-338

Meer, D.M., Bajaja, S. and Kaur, S. 1995. Impact of death of siblings. *Fd Nutr. Bull.* 14: 294-302

Mellner, C. and Christin, M.V. 2003. Women's subjective and objective health over time: the role of psychosocial conditions and psychological stress responses. *Psychol. Health Med.* 8: 123-135

Mercola, D.O. and Joseph, M. 2000. Nutrients in fruits and vegetables linked to bone health. *Am. J. Clin. Nutr.* 71: 142-151

Meyer, M. 2000. Why middle-aged women gain weight and how to stop it. *Nutr. Rev.* 57: 282-294

Misra, B. 1989. Issues in Agricultural Development. *Agric. Situ. Ind.* 43: 72-78

*Moffatt, M.E.K. 1995. Current status of nutritional deficiencies in Canadian Aboriginal People. *Can. J. Physiol. Pharmacol.* 73: 754-758

Munger, R.G., Cerhan, J.R. and Chiu, B. 1999. Prospective study of dietary protein intake and risk of hip fracture in post menopausal women. *Am. J. Clin. Nutr.* 69: 147-152

Nagi, M. and Mann, S.K. 1991. Nutrient intake of Punjabi women with special reference to iron availability. *J. Fd Sci. Technol.* 28: 4230-4233

Nathawat, S.S. and Mathur, A. 1993. Marital adjustment and subjective well-being in Indian educated housewives and working women. *J. Psychol.* 127: 353-358

National Institute of Nutrition. 1993. *Nutrition Trends in India.NIN,* Hyderabad, p. 78

National Nutritional Survey. 2001. *Fifth National Nutritional Survey Report of Nigeria*. Department of Public Health, Nigeria, p. 1248

Nayak, N. 1992. *Continuity and change in artisanal fishing communities – A study of socio-economic conditions of artisanal fishing communities on the South-West Coast of India following motorisation of fishing crafts.* Programme for Community Organization. South Indian Federation Fishermen Societies, Thiruvananthapuram, p. 108

Nelson, M.E. 2004. A high ratio of dietary fruits and vegetables increase the rate of bone loss and risk of fracture in post-menopausal women. *Calcif. Tissue Int.* 47: 29-38

New D. 2003. Fruits and vegetables to bone health. *Ann. Inter. Med.* 130: 376-379

NFHS. 1999. National Family Health Survey Report-2. Indian Institute of Population Studies, Mumbai, p. 1017

NIN. 1985. Nutritional status and reproductive performance of working women. *Nutr. News.* 12: 3

NIN. 1991. *Report on Repeat Surveys 1988-90.* Indian Council For Medical Research, Hyderabad, p. 342

NIN. 1993. *Nutrition Trends in India.* Indian Council For Medical Research, Hyderabad, p. 204

NNMB. 1991. *Nutritional Status of Indian Adults.* National Institute of Nutrition, ICMR, Hyderabad, p. 178

NNMB. 1997. *Food and Nutrient Intake and Nutritional Status by Socio-economic variables – Rural.* National Nutrition Monitoring Bureau, Hyderabad, p. 54

NNMB. 2000. Report of the Second Repeat Survey. National Nutrition Monitoring Bureau, p. 428

*Nutrition Consultancy of Guatemala. 1997. Dietary intake and costs effectiveness of rural adult women aged 50-65 in Guatemala. *Soc. Sci. Med.* 45: 238-251

O'Brien, S.J., Vertinsky, P.A. 1991. Unfit survivors -Exercise as a resource for aging women. *Gerontologist.* 31: 347-357

Okake, E.C., Nweke, F.I. and Nuanvelugo, D.O. 1983. The consequences of absence of adult males on the nutritional status of members of rural farm households and implications on rural development programmes: a case study. *Rur. Dev. Abst.* 12 :167-178

Oshima, S., Sakamoto, H., Ishiguro, Y. and Terao, J. 1997. Accumulation and clearance of capsanthin in blood plasma after the ingestion of paprika juice in men. *J. Nutr.* 127: 1475-1479

*Ottesen, H.G., Mascarenhas, O. and Wandel, M. 1989. Women's role in food production and nutrition: Implications for their quality of life. *Fd. Nutr. Bull.* 10: 8-15

Park, J.E. and Park, K. 1997. *Textbook of Preventive and Social Medicine*. Thirteenth edition. Banarsidas Bhanot Publishers, Jabalpur, p. 351

Patricia, T.S. 2004. *Women in Developing Countries*. Second edition. Wilson Publishing Co. Ltd., New York, p. 433

Paul, M. 2002. Osteoporosis: Risk factors and prevention. *Indian J. Nutr. Dietet.* 39: 427-434

Perez, T.S., Pollit, N.R. and Gunn, P.T. 1980. *Thyroid*. Second edition. Wiley and Sons, New York, p. 87

Pickering, H., Pogue, J., Manson, J.L. and Jacob, S.A. 1991. Primary prevention of coronary heart disease in middle aged women through diet and lifestyle. *N. Engl. J. Med.* 240: 27-35

Pope, C.M. 2003. The association of body weight, dietary intake and energy expenditure with dietary restraint and disinhibition. *Obes. Res. 27*: 158-167

Prasad, M.P.P., Krishna, T.P., Pasricha, S., Quereshi, M.A. and Krishnaswamy, K. 1995. Diet and oral cancer-a case control study. *Asia Pacif. J. Clin. Nutr.* 4: 259-264

Radack, B.L., Bremmer, R.D. and Bloomfield, S.A. 1999. Prevention of postmenopausal osteoarthritis: A comparative study of exercise calcium supplementation and hormone replacement therapy. *New Eng. J. Med.* 349: 973-989

Raghuramulu, N., Madhavan, N. and Kalyanasundaram, S. 2001. *A Manual of Laboratory Techniques.* Second edition. National Institute of Nutrition, Hyderabad, p. 365

Rahman, M. 2000. Effect of socio-economic status of food consumption pattern and nutrient intakes of adults – A case study. *Ind. J. Nutr. Dietet.* 38: 292-300

Ramakrishnan, U. 2002. Prevalence of micronutrient malnutrition worldwide. *Nutr. Rev.* 60: 46-51

Raman, L. and Sarma, R.K.V. 2003. Nutrition and Anaemia. *Textbook of Human Nutrition* (eds. Bamji, M.S., Rao, N.P. and Reddy, V.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, pp. 279-290

Ramankutty, V., Balakrishnan, K.G., Jayasree, A.K. and Thomas, J. 1993. Prevalence of coronary heart disease in the rural population of Thiruvananthapuram district. *Int. J. Cardiol.* 28: 38-39

Ranganath, L. 1996. Nutritional status of women engaged in the coir industry. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 287

Rao, N.B.S. and Prabhavathi, T. 1978. An *in vitro* method for predicting the bioavailability of iron from foods. *Am. J. Clin. Nutr.* 31: 169-175

Rao, V. 1991. Improving rural health scenario. *Kurukshetra.* 39: 36-38

Ratnatunka, D.P. 2002. Vitamins for the treatment of cancer among women in Colombia. *New Eng. J. Med.* 358: 1320-1337

Rock, C.L., Lovalvo, J.L., Menhiser, C., Ruffin, M.T., Flatt, S.W. and Schwartz, S.S. 1998. Bioavailablity of β-carotene is lower in raw than in processed carrots and spinach in women. *J. Nutr.* 128: 913-916

Root, Z. 1998. Degenerative, life style disease among obese middle aged women. *Metab.* 49: 283-294

Ryan, J.G., Bidinger, P.D., Rao, P.N. and Pushpamma, P. 1994. The determinants of individual diets and nutritional status in six villages of South India. Research Bulletin No. 7. ICRISAT, Andhra Pradesh, India, p. 29

Saltzman, E.W. 1995. Dietary determinants of energy intake and body parameters in healthy adults. *J. Nutr.* 68: 278-279

Samaras, K. 1997. Genetic factors determine the amount and distribution of fat in women after the menopause. *J. Clin. Endocrinol. Metab.* 82: 781-785

Samuel, S., Omenn, D.M., Salen, T.W. and Gulling, Y. 2001. Gender and diabetes. *N. Thai. J. Med.* 82: 301-314

Sandra, Y.A. 2000. Eating disorders at middle age. *Eat. Dis. Rev.* 15: 175-193

Shephered, K.M. 2000. Global burden of diabetes. *Ann. Int. Med.* 123: 678-689

Silberg, T.S. 1995. Rheumatoid arthritis of the foot and ankle. *J. Am. Acad. Orthop. Surg.* 2: 326-332

*Silman, P. 1987. Women and arthritis burden impact and prevention programs. *Int. J. Obes. Metab. Disord.* 10: 62-77

Silventoinen, K., Pankov, J., Pekka, J., Gang, H.U. and Jaakko, T. 2005. Educational inequalities in the metabolic syndrome and coronary heart disease among middle aged men and women. *Int. J. Epid.* 34: 327-334

Singh, R.C., Raman, W.M., Chawla, S., Ahmed, Y., Gupta, R. 1996. Calcium intake in mid life women: One step in preventing osteoporosis. *Orthop. Nurs.* 13: 11-18

Smith, S.A., Spiegelman, D. and Yaun, S.S. 1998. Alcohol and breast cancer in women: a pooled analysis of cohort studies. *JAMA.* 279: 535-540

Sreevastava, U.V. 2000. Bone health and minerals. *Free. Radic. Biol. Med.* 29: 212-223

Srilatha, V.L. and Gopinathan, P.K. 1995. Striking poverty at the root. *Economic Times*, Monday 10, July 1995, p. 12

Srinivasan, R., Manimegalai, G. and Padmini, T. 1991. Rural nutrition demands – special attention. *J. Rur. Dev.* 10: 455-466

Srivastava, R.P. and Kumar, S. 1994. *Fruit and Vegetable Preservation.* International Book Distributing Company, Lucknow, p. 307

Stamfer, M.S., Manson, J.E., Rinnm, E.B. and Willett, W.C. 2000. Prevention of coronary heart disease in women . *Eng. J. Med.* 342: 16-22

Steek, P., Dobson, A., Alexander, H. and Ruselb, A. 1991. Who eats what- A comparison of dietary patterns among men and women in different occupational groups. *Aust. J. Pub. Health.* 15: 286-295

Stewart, D.E. 1997. Women's health comes of age. *Can. J. Med. Ass.* 157: 1711-1712

Suhano, D., West, C.E., Muhilal, E., Karyadi, D. and Hautvast, J.G. 1993. Supplementation with vitamin A and iron for nutritional anaemia in pregnant women in West Java. *LANCET.* 342: 1325-1328

Suja, P.T. 1989. Effect of birth orders and spacing on the nutritional status of mother and child. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 160

Sujatha, A.S. 1990. Food consumption and energy expenditure pattern of self employed home in unorganized sector. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 125

Suki, R.W. 2001. Ethinic differences in dietary intakes, physical activity and energy expenditure in middle aged pre-menopausal women: the healthy transition study. *Am. J. Clin. Nutr.* 74: 90-95

Sunder, T.S., Cutting, A.K. and Casey, G.S. 1997. Effect of exercise and dietary restrain on energy intake of middle aged women. *Obes. Res.* 15: 55-70

Tamber, T.L. 1999. Obesity related morbidity and mortality in US adults. *JAMA.* 283: 1328-1341

Taylor, T.N. 1995. Overweight and coronary heart diseases among African – American women. *Prev. Med.* 31: 232-240

Thimmayamma, B.V.S. and Rau, P. 1996. Assessment of nutritional status. *Text Book of Human Nutrition* (eds. Bamji, S.M., Rao, V.P. and Reddy, V.). Oxford and IBH Publishing Pvt. Ltd., New Delhi, pp. 123-125

Thomas, J.E.F. 2000. Dietary intake and prevalence of cancer among women. *Can. Res.* 103: 67-89

*Tinnerello, D.M. 1999. Breast cancer : fighting it with food. *Eur. J. Cancer. Prev.* 9: 532-547

Townsend, J. 1999. *Stress tips – Stress Evaluation and Management Techniques*. Macmillan Publishing Company, New York, p. 288

U.N. 2004. *Micronutrition and Poverty*. Technical Bulletin No. 88. United Nations, Geneva, p. 448

U.S. Department of Health and Human Statistics. 2001. *Healthy People 2000*. United States Government Printers, Washington, p. 298

*Vazquez, U., Rodriguez, R.J.C. and Zima, R.L.G. 1991. Working women and health of four groups of women in Guadalajra, Mexico.*Bolofficina Sanit Panam*. 111: 101-111

Viajayan, A. 2003. Extent of household food security of selected families of landless agricultural labourers of Kalliyoor panchayat – A case study. M.Sc. (FS & N) thesis, Kerala Agricultural University, Thrissur, p. 223

Victor, M. and James, H. 2002. Evaluation of micronutrients and its relation to lifestyle diseases among older citizens. *J. Nutr. Heal Agi* 5: 243-247

Viteri, F.E. 1997. Prevention of iron deficiency. In: *Prevention of Micronutrient Deficiencies – Tools for Policy Makers and Public*

Health Workers. Third edition. National Academy Press, Washington , p. 503

Walker, K.Z. 2001. Dietary composition affects regional body fat distribution and levels of dehydro-opiandrosterone sulphate in pre and post menopausal women with Type 2 diabetes. *Euro. J. Clin. Nutr.* 59: 734-753

Waril, A.F., Kelly, P.J. and Marin, P. 1998. Post menopausal replacement therapy prevents central distribution of body fat after the menopause. *Int. J. Obes. Relat. Matab Disord.* 24: 631-640

Wasier, J.P. 1996. The etiology and degenerative diseases: relative contribution of metabolic factors diet and physical activity. *Am. J. Med.* 98: 148-159

West, K.P., Katz, J., Khatry, S. and Fleming, J.T. 1999. Double blind cluster randomized trial of low dose supplementation with vitamin A or beta carotene on mortality related to women. *BMJ.* 318: 570-575

WHO. 1995. Global Prevalence of Vitamin A deficiency. MDIS Working Paper-2. WHO, Geneva, p. 834

WHO. 1996. *Indicators for assessing iodine deficiency disorders and their control.* Technical Bulletin No. 432. World Health Organization, Geneva, p. 332

WHO. 1996. The assessment of the nutritional status of the community. Monograph Series No. 53. World Health Organization, Geneva, p. 212

WHO. 1997. *The Tools Used in Nutritional Surveillance.* Fifth edition. World Helath Organization, Geneva, p. 124

WHO. 1998. *Nutritional anaemia.* Technical Series NO. 503. World Health Organization, Geneva, p. 133

WHO. 2000. *Physical Status: the Use and Interpretation of Anthropometry*. Technical Report Series No. 854. World Helath Organization, Geneva, p. 220

WHO. 2000. *Life in the 21st Century : A Vision for All.* Technical Bulletin No. 17. World Health Organization, Geneva, p. 110

WHO. 2002. *Global database on iron deficiency anaemia.* Technical Bulletin No. 573. World Health Organization, Geneva, p. 233

WHO. 2002. Global prevalence of degenerative diseases. Working paper No. 11. World Health Organization, Geneva, p. 79

WHO. 2003. Diabetes mellitus and hypertension. *Tech. Bull. No. 17.* 158: 101

WHO/FAO. 1988. *Requirements of vitamin A, non-folate and vitamin B_{12}.* Fd Nutr. Ser. No. 23. World Health Organization / Food and Agriculture Organization of the United Nations, Rome, p. 107

Wilcox, S. and Stefanick, M.L. 1999. Knowledge and perceived risk of major diseases in middle aged and older women. *Heal. Psychol.* 18: 346-353

*Wilk, C.A. 1995. Menopause: a developmental stage not a deficiency disease. *Psychother.* 32: 232-241

Wing, G., Crawford, S.L. and Haarbo, J. 1999. Genetic factors determine the amount of distribution of fat in women after the menopause. *J. Clin. Endo. Metab.* 97: 432-438

Wong, P., Riguera, I. and Valencia, M.E. 1985. Relation between family income, expenditure and food intake in marginal urban areas of Sonora Mexico. *Nutr. Abst. Rev.* 55: 505-585

Wood, D.B. 1999. *The Story of Iodine Deficiency: and International Challenge in Nutrition.* Third edition. Oxford University Press, New York, p. 401

World Bank. 2000. *A New Agenda for Women's Health and Nutrition.* Oxford University Press, USA, p. 381

World Bank. 2003. *World Development Report.* Oxford University Press, Washington , p. 1021

Yamada, K. 2000. Poverty among adult women. *Int. J. Vit. Nutr. Res.* 59: 365-372

Yeolekar, M.E., Shahani, S., Maroli, S. and Pawar, D. 2001. Prevention of coronary heart disease in post-menopausal women – Role of soya protein. *JAMA.* 4: 21-243

Zimmermann, M.B., Adou, P., Torresani, T. and Hurell, R.F. 2005. Treatment of iron deficiency in goitrous children improves the efficiency of iodized salt in Cote d'Ivoire. *Am. J. Clin. Nutr.* 75: 743-748

Zimmermann, M.B., Chauki, N. and Hurrell, R.F. 2005. Iron deficiency due to consumption of a habitual diet low in bioavailable iron : a longitudinal cohort study in Moroccan children. *Am. J. Clin. Nutr.* 81: 115-121

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*Original not seen

Appendices

APPENDIX - I

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Questionnaire to elicit information on the socio-economic background of the selected BPL families

Serial number of household :

Name of the panchayat :

Name of the respondent :

Address :

Details regarding the socio-economic status of the family

Age

Sex

Religion

Occupation

Type of family

Household members and their demographic particulars

Sl. No.	Name of the members	Sex	Actual Age	Relation with the respondent	Marital status	Education	Occupation	Monthly income

Number of children

Number of adults

Number of elders

Details regarding income from other sources

Agriculture	Amount
Coconut	
Banana	
Paddy	
Vegetables	
Animal husbandry	
Poultry	
Cow	
Goat	
Others	

Monthly expenditure pattern of the family

Food	Item	Amount
Clothing		
Housing		
Education		
Transportation		
Newspaper		
Medicine/heath		
Recreation		
Donation/Gift or marriage		
Ceremonies and festivals		
Electricity		
Water		
Fuel		
Cable		
Repaying loan		
Saving/LIC/Chitty		
Purchase of household amenities		
Food outside home		
Individual expenses		
Financial liabilities		
Total		

Savings : Yes/No

Nature of savings (a) Post (b) Insurance (c) Chitties

(d) Bank (e) Ornaments (f) Land (g) Others.

Debt	: Yes/No
Purpose of money borrowed	: (a) Food (b) Cloth (c) Education (d) Housing (e) Treatment (f) Daily household exp. (g) Repaying loan (h) Marriage (i) Others
Source of borrowing	: (a) Private bank (b) Govt. banks (c) Friends (d) Relatives
Most important economic problem	: (a) Housing (b) Treatment (c) Repay loan (d) Lack of permanent employment (e) Absence of male earning members (f) Others
Major decision taken	: (a) Husband (b) Wife (c) Others
Possession of land	: Yes/No
If yes specify area	:
Nature of house	: Own/joint/rented/leased/own house but constructed by government
Type of house	: Terraced/tiled/sheeted/thatched
Type of wall	: Brick/mud/raw brick/reed coconut leaves/stone/any other
Type of flooring	: Mud/cement/wood/ cowdung/polished/tiles/others
Whether the house is electrified	: Yes/No
If not which is the source used for lighting	:
Number of rooms	:
Availability of latrine facility	: Yes/No
Availability of drainage facility	: Yes/No
Source of drinking water	: Well/pipe/street pipe/pond/river
Fuel used for cooking	: Gas/coal/fire wood/kerosene/cowdung/ Gobar gas/ Sawdust/electricity/ rice husk

APPENDIX- II

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Questionnaire to gather information about the personal habits of middle aged BPL women

Serial number of household :

1. Do you consume alcohol : Yes/No

   Indicate the quantity consumed

2. Do you have the habit of smoking : Yes/No

   If yes, indicate whether it is (1) Beedi (2) Cigarette

   Indicate the number smoked per day

3. Do you have the habit of chewing pan: Yes/No

   If yes frequency of chewing :

4. Do you take bath everyday :

   If yes, frequency of bath/day (a) One (b) Two (c) more than two

APPENDIX - III

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Questionnaire to gather information about the dietary pattern of middle aged BPL women

Serial number of household :

Dietary pattern of the respondent

Food habits of the respondent : a) Vegetarian/ Lacto vegetarian / ovo-vegetarian
b) Non-vegetarian

Is your meal pattern a) 2 meals/day (b) 3 mealy/day
c) 4 meals/day

Do you have a specific time schedule for taking food : Yes/No

Do you have the habit of skipping meals? : Yes/No

Food expenditure pattern and frequency of purchase in the family

Items	Frequency of purchase					Amount spent on
	Daily	Weekly	Monthly	Never	Occasionally	
Cereals						
Rice						
Wheat						
Pulse and legumes						
Green leafy vegetables						
Other vegetables						
Roots and tubers						
Fruits						
Nuts and oil seeds						

Sugar and jaggery						
Milk						
Bakery products						
Milk products						
Spices condiments						
Fish and fish products						
Health drinks and beverages						
Meat						
Egg						
Fats and oils						

Food use frequency

Food stuff	Qty. cons	Daily	Weekly once	Weekly twice	Weekly thrice	Once in month	Occass-ionally
Cereals							
Rice							
Wheat							
Others							
Pulses							
Green gram							
Bengal gram							
Blackgram							
Cowpea							
Any other							
Green leafy							
Amaranth							
Drumstick leaves							
Cabbage							
Others							
Other vegetables							
Cucumber							
Beans							
Bread fruit							

Ladies finger							
Others							
Roots and tubers							
Carrot							
Onion							
Tapioca							
Others							
Fruits							
Guava							
Pineapple							
Papaya							
Banana							
Others							
Nuts & Oilseeds							
Ground nuts							
Coconut							
Others							
Milk							
Egg							
Fish							
Meat							
Oil							
Sugar							
Jaggery							
Beverages							
Tea							
Coffee							
Carbonated beverages							
Fruit juices							
Processed foods							
Pappad							
Bakery items							
Others							

APPENDIX – IV

KERALA AGRICULTURAL UNIVERSITY
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DEPARTMENT OF HOME SCIENCE

Interview schedule to elicit information regarding the time utilization pattern of the middle aged BPL women

Serial number of household :

Daily routine of the respondent **(Employed)**

Time of waking up:

Time spend on personal activities :

Household work done before going to the work site

Sl. No.	Type of work	Time taken	Nature of assistance from others	Person who assist

At what time do you start for work from the house?

The time of reaching the work place:

Time taken to reach the work site from home :

Distance covered to work site from home:

Means of reaching (conveyance) the work site

At what time do you start actual work :

Nature of type work done in the work site:

Average time of working time/day:

Do you rest in between work: Yes/No

If yes, mention frequency and specify time:

Do you take food in between work : Yes/No

If yes, how many times (a) Once (b) Twice (c) thrice (d) more than 3 times

Mention the food stuffs eaten in between work

Source of food eaten in between work

(a) Home made (b) Hotel (c) Thattukada (d) Others (specify)

The time of return to home :

At what time will you reach the home:

Made of conveyance from work place to home:

The type of works done after reaching the home:

Sl. No.	Type of work	Time taken	Assistance from others

Do you have off-day in a week: Yes/No

How do you spend your off day

Sl. No.	Activities	Time spend	Assistance from others

At what time do you take food after coming from work site

Foods taken	Timing

Do you get leisure time at home after coming from work site: Yes/No

If yes, how will you utilize that time:

Time at which you will retire to bed:

How long have you been employed:

Are you satisfied with this work schedule: Yes/No

If yes/No specify the reason

Daily routine of the respondent (unemployed)

1. Time of waking up:
2. Household chores attended during the day

Sl. No.	Activities	Time spent	Assistance available	Person rendering assistance

3. Do you use any household appliances for doing household chores : Yes/No

   If yes, what are they?

4. Meal pattern at home

Sl. No.	Meal taken	Timing

5. Do you get leisure time at home: Yes/NO

   If yes how will you spent this time

Sl. No.	Leisure time	How will you utilize this leisure time

If no, give reason

6. Time at which you retire to bed:
7. Average time spend for sleeping
8. Are you satisfied with this work schedule: Yes/No

   If Yes/No, give the reason

APPENDIX - V

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Schedule used for clinical examination (WHO, 1997)

Name	Date
Sex	Age
Pregnant	Lactating
Height	Weight
Waist circumference	Upper arm circumference
Mid upper arm circumference	Skin fold thickness
Haemoglobin	Hip circumference

Hair

1.Lack of luster

2. Depigmentation

3. Texture change

4. Easily pickable

Face

1. Moonface

2.Pallor

Skin

1. Xerosis (dry scale)

2. Follicular hyperkeratosis

3.Mosaic (Crazy pavement)

4. Pellagrous dermatosis

5. Skin haemorrhages

6. Flaky-paint dermatosis

7. Scrotal or vulval dermatosis

8. Oedema

9.Ulcers

APPENDIX – V Continued

Eyes

1. Xerosis conjunctivae or Xerophthalmia
2. Keratomalacia
3. Conjunctival thickening or wrinkling
4. Bitot's spots
5. Conjuctival injection or vascularisation
6. Corneal scars

Muscles

1. Wasting

Skeleton

1. Epiphysesl enlargement
2. Beading of ribs (rickety rosary)
3. Skeletal deformities
4. Subperiosteal haematomas

Mouth

1. Angular stomatitis
2. Cheilosis of lips
3. Angular scars
4. Spongy or bleeding gums
5. Mottled teeth
6. No. teeth decayed (D)
7. No. teeth missing (M)
8. No. teeth filled (F)

Glands

Thyroid

Goitre

Grade (0,1,2,3,)

Remarks (include other Abnormalities)

APPENDIX - VI

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Questionnaire to elicit details regarding the health history of middle aged BPL women

Serial number of household :

Birth order of the respondent :

Age of menarche :

Age of menopause :

Do you suffer from any discomfort during these period: Yes/No

If yes, specify

Condition	Discomfort suffered
Menarche	
Menopause	

Age at marriage

Number of pregnancy :

History of miscarriage/still birth/abortion/premature birth

Nature of each deliveries

	I	II	III	IV	V
Place of delivery					
Normal					
Caesarian					
Abortion					

Are you suffering from

	Yes	No	Duration of disease
High blood pressure			
Diabetes			
Heart diseases			
Renal diseases			
Skin diseases			

Obesity			
Thyroid disease			
Gastro intestinal problem			
Epilepsy			
Liver diseases			
Fatigue			
Or any other			

APPENDIX - VII

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Total scores for rural quality of life

Serial Number	Total Score	Serial Number	Total Score	Serial Number	Total Score	Serial Number	Total Score
1	26	39	16	77	16	115	10
2	19	40	40	78	28	116	26
3	43	41	30	79	26	117	25
4	27	42	09	80	42	118	27
5	5	43	26	81	30	119	46
6	32	44	32	82	16	120	15
7	29	45	21	83	27	121	26
8	21	46	39	84	18	122	17
9	37	47	16	85	38	123	38
10	18	48	30	86	14	124	30
11	33	49	33	87	27	125	27
12	39	50	38	88	29	126	43
13	13	51	15	89	16	127	38
14	28	52	35	90	30	128	37
15	47	53	34	91	31	129	18
16	31	54	49	92	18	130	30
17	17	55	35	93	26	131	11
18	30	56	11	94	39	132	35
19	20	57	39	95	17	133	26
20	21	58	26	96	31	134	22
21	32	59	21	97	36	135	34
22	28	60	26	98	27	136	28
23	38	61	24	99	17	137	13
24	22	62	27	100	39	138	31
25	34	63	31	101	26	139	34
26	39	64	23	102	31	140	21
27	26	65	33	103	24	141	26
28	20	66	30	104	26	142	33
29	29	67	20	105	16	143	23
30	32	68	35	106	36	144	28
31	16	69	43	107	13	145	35
32	28	70	34	108	31	146	49
33	12	71	25	109	46	147	37
34	27	72	33	110	38	148	18
35	21	73	11	111	20	149	39
36	28	74	27	112	31	150	28
37	12	75	21	113	27	151	37
38	27	76	38	114	29	152	41

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APPENDIX – VII Continued

Serial Number	Total Score	Serial Number	Total Score	Serial number	Total Score	Serial Number	Total Score
153	32	191	29	229	52	267	39
154	17	192	30	230	39	268	18
155	26	193	14	231	11	269	31
156	45	194	31	232	35	270	26
157	29	195	26	233	27	271	24
158	18	196	18	234	33	272	27
159	36	197	34	235	19	273	49
160	26	198	21	236	32	274	28
161	24	199	29	237	26	275	11
162	26	200	32	238	24	276	30
163	33	201	18	239	31	277	25
164	24	202	28	240	28	278	28
165	31	203	26	241	39	279	15
166	26	204	17	242	20	280	34
167	18	205	38	243	34	281	29
168	33	206	36	244	30	282	44
169	27	207	21	245	34	283	28
170	25	208	29	246	17	284	51
171	28	209	27	247	29	285	30
172	51	210	20	248	31	286	12
173	28	211	37	249	18	287	27
174	32	212	45	250	33	288	30
175	28	213	27	251	29	289	52
176	23	214	13	252	09	290	32
177	33	215	31	253	28	291	12
178	26	216	29	254	38	292	27
179	33	217	20	255	48	293	18
180	29	218	28	256	30	294	39
181	17	219	18	257	26	295	31
182	31	220	27	258	21	296	11
183	31	221	45	259	32	297	38
184	26	222	28	260	40	298	34
185	23	223	37	261	34	299	26
186	37	224	20	262	31	300	33
187	51	225	34	263	17		
188	33	226	38	264	26		
189	20	227	25	265	29		
190	34	228	32	266	31		

APPENDIX – VIII

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Total scores for stress and strain

Sl. No.	Scores	Sl. No.	Scores	Sl. No.	Scores	Sl. No.	Scores	Sl. No.	Scores
1	8	41	12	81	11	121	10	161	22
2	22	42	21	82	10	122	16	162	27
3	11	43	23	83	27	123	28	163	26
4	21	44	17	84	14	124	21	164	17
5	26	45	24	85	26	125	15	165	22
6	14	46	22	86	23	126	26	166	21
7	29	47	18	87	21	127	25	167	27
8	21	48	27	88	9	128	19	168	21
9	7	49	23	89	22	129	21	169	16
10	24	50	10	90	16	130	20	170	23
11	16	51	21	91	27	131	14	171	21
12	23	52	21	92	28	132	21	172	26
13	21	53	11	93	24	133	13	173	24
14	24	54	7	94	15	134	9	174	15
15	26	55	21	95	22	135	27	175	25
16	6	56	13	96	21	136	24	176	28
17	28	57	24	97	19	137	12	177	26
18	18	58	27	98	22	138	22	178	12
19	27	59	8	99	8	139	21	179	27
20	22	60	17	100	27	140	7	180	22
21	19	61	29	101	17	141	23	181	21
22	9	62	26	102	26	142	14	182	20
23	21	63	16	103	24	143	22	183	19
24	20	64	22	104	23	144	27	184	21
25	24	65	21	105	21	145	25	185	20
26	23	66	19	106	8	146	16	186	26
27	21	67	21	107	27	147	26	187	21
28	19	68	24	108	14	148	27	188	22
29	26	69	9	109	26	149	21	189	9
30	10	70	23	110	23	150	10	190	27
31	16	71	18	111	9	151	23	191	13
32	25	72	27	112	22	152	18	192	26
33	22	73	25	113	13	153	21	193	17
34	14	74	17	114	26	154	26	194	25
35	21	75	21	115	27	155	19	195	24
36	24	76	26	116	21	156	25	196	21
37	11	77	22	117	19	157	20	197	27
38	9	78	21	118	23	158	21	198	8
39	26	79	19	119	21	159	23	199	25
40	28	80	21	120	27	160	16	200	15

APPENDIX – VIII Continued

Sl. No.	Scores	Sl. No.	Scores	Sl. No.	Scores
201	21	241	19	281	27
202	16	242	9	282	18
203	27	243	24	283	16
204	26	244	20	284	27
205	17	245	21	285	10
206	25	246	17	286	17
207	25	247	22	287	26
208	11	248	11	288	24
209	22	249	23	289	28
210	24	250	14	290	27
211	14	251	21	291	22
212	21	252	13	292	21
213	26	253	26	293	27
214	10	254	7	294	29
215	23	255	16	295	25
216	16	256	15	296	27
217	21	257	28	297	22
218	11	258	22	298	27
219	13	259	16	299	23
220	18	260	21	300	25
221	27	261	17		
222	9	262	10		
223	29	263	17		
224	19	264	22		
225	25	265	18		
226	20	266	27		
227	23	267	26		
228	14	268	14		
229	21	269	22		
230	16	270	12		
231	8	271	19		
232	24	272	10		
233	21	273	27		
234	15	274	17		
235	22	275	26		
236	7	276	21		
237	27	277	19		
238	18	278	9		
239	25	279	23		
240	16	280	20		

APPENDIX - IX

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Age and anthropometric measurements of the subjects

Sl. No.	Age	HT	WT	BMI	SFT	MUAC	WC	HC	WHR
1	43	1.54	49	20.67	11.7	22.5	22	26	0.84
2	54	1.62	42	16.01	6.3	22.1	24	29	0.83
3	49	1.59	40	15.82	5.3	20	23	28	0.82
4	53	1.41	42	21.13	11.9	22.9	29	33	0.87
5	48	1.57	45	18.26	7.2	22	28	31	0.9
6	49	1.62	50	19.05	7.5	22.1	28	31	0.9
7	51	1.53	43	18.37	7.2	22	28	30	0.93
8	54	1.52	34	15.15	5.2	20	23	25	0.92
9	42	1.54	42	17.71	7.1	22.1	28	32	0.87
10	46	1.49	64	28.83	12.7	28	28	32	0.88
11	48	1.64	45	16.73	6.7	21	26	30	0.87
12	40	1.46	40	18.77	7.3	22	27	30	0.9
13	41	1.62	42	16.01	6.2	22	25	27	0.93
14	47	1.59	40	15.82	5.3	20	23	28	0.82
15	55	1.45	70	34.29	13.3	33	32	35	0.91
16	52	1.57	39	15.82	5.3	20	25	28	0.89
17	49	1.46	38	17.83	7.3	21.3	28	30	0.93
18	49	1.38	41	21.53	12	22.9	28	33	0.85
19	43	1.53	53	22.64	12.6	23	27	32	0.84
20	41	1.48	40	18.26	7.6	22	27	29	0.93
21	40	1.54	37	15.6	5.2	20	24	26	0.92
22	53	1.58	43	17.22	7.1	21	27	29	0.93
23	52	1.39	67	34.68	13.3	33	31	35	0.88
24	44	1.58	40	16.02	6.3	21	25	28	0.89
25	43	1.47	36	16.66	6.5	21	26	30	0.87
26	52	1.57	39	15.82	5.3	20	24	28	0.86
27	55	1.61	41	15.82	5.3	20	23	28	0.82
28	49	1.54	40	16.89	6.7	21	26	31	0.84
29	54	1.53	43	18.36	7.3	21.3	27	32	0.84
30	51	1.59	40	15.82	5.3	20	23	28	0.82
31	50	1.48	60	27.39	12.8	28	29	32	0.91
32	48	1.43	38	18.58	7.2	20	28	31	0.9
33	41	1.53	53	22.64	12.1	23	28	33	0.85
34	45	1.6	58	22.66	12.1	23	27	31	0.87
35	50	1.55	41	17.06	7.1	20	26	30	0.87

36	53	1.64	66	24.54	12.8	24	29	33	0.88
37	50	1.61	44	16.97	6.7	21	26	31	0.84
38	46	1.56	38	15.61	5.2	20	23	26	0.88
39	51	1.58	40	16.02	6.3	22	26	30	0.87
40	54	1.55	67	27.89	12.5	28	30	33	0.91
41	44	1.5	38	16.89	6.7	21	26	30	0.87
42	48	1.53	58	24.78	12.8	24	29	33	0.88
43	50	1.52	39	16.88	6.4	22	26	30	0.87
44	55	1.56	73	29.1	13	29	31	34	0.91
45	52	1.53	43	18.36	7.7	23	26	30	0.87
46	41	1.55	52	21.64	12	22.9	27	31	0.87
47	43	1.49	55	24.77	12.8	24	26	30	0.87
48	46	1.54	40	16.87	6.7	21	26	28	0.93
49	52	1.52	39	16.88	6.7	21	26	29	0.9
50	50	1.55	45	18.73	7.3	22	27	30	0.9
51	53	1.6	49	19.14	7.6	22.1	27	30	0.9
52	55	1.54	40	16.87	6.5	22	26	30	0.87
53	52	1.52	42	18.17	7.6	22	25	30	0.83
54	40	1.61	41	15.81	5.3	20	23	28	0.82
55	43	1.55	62	25.81	12.3	24	27	31	0.87
56	45	1.47	40	18.51	7.6	22	28	30	0.93
57	55	1.54	40	16.87	6.7	21	26	29	0.9
58	53	1.54	42	17.71	7.1	20	24	28	0.86
59	45	1.56	49	20.13	11.8	22.3	22	27	0.81
60	53	1.45	58	27.59	12.7	28	29	32	0.91
61	41	1.58	40	16.02	6.3	21	25	27	0.93
62	45	1.55	54	22.48	11.7	23	27	32	0.84
63	47	1.5	64	28.44	12.8	28.4	29	31	0.94
64	50	1.43	50	24.45	11.9	24	28	33	0.85
65	53	1.5	52	23.11	11.7	23.6	29	32	0.91
66	55	1.55	59	24.56	12	24	29	35	0.83
67	51	1.49	47	21.17	11	22.8	29	33	0.88
68	48	1.53	43	18.36	7.6	22	27	29	0.93
69	40	1.52	39	16.88	6.7	21	26	28	0.92
70	42	1.6	55	21.48	11	22.5	27	33	0.82
71	54	1.58	48	19.23	7.6	22.1	28	30	0.93
72	54	1.46	51	23.93	12.1	23.6	30	34	0.88
73	53	1.51	59	25.88	12.3	24	29	32	0.91
74	44	1.54	45	18.97	7.6	22	28	30	0.93
75	41	1.52	39	16.88	6.7	21	26	29	0.9
76	54	1.54	43	18.13	7.5	20	24	30	0.8
77	43	1.55	51	21.23	10.9	22.5	27	31	0.87
78	44	1.46	49	22.99	11.8	23	28	30	0.93
79	52	1.48	60	27.39	12.5	28	30	34	0.88
80	51	1.5	55	24.44	12.1	24	29	32	0.91

81	43	1.48	49	22.37	11.8	23	26	30	0.87
82	50	1.51	54	23.67	11.9	23.5	29	34	0.85
83	40	1.54	49	20.66	11.7	22.3	25	29	0.86
83	53	1.54	41	17.29	7.5	24	26	30	0.87
84	43	1.47	40	18.51	7.6	22	27	30	0.9
85	47	1.53	41	17.51	7.1	21.3	27	29	0.93
87	42	1.5	40	17.78	7.1	21.3	27	30	0.9
88	49	1.54	43	18.13	7.5	22	27	29	0.93
89	54	1.49	54	24.32	12	24	26	29	0.9
90	41	1.5	45	20	11.7	22.1	22	26	0.85
91	46	1.51	45	19.74	7.7	22.2	28	31	0.9
92	52	1.5	41	18.22	7.2	22	29	33	82
93	45	1.49	48	21.62	11.1	22.7	27	32	0.84
94	50	1.55	51	21.22	11	22.7	29	35	0.83
95	44	1.56	44	18.08	7.2	22	28	33	0.85
96	43	1.48	52	23.74	11.9	23.5	28	32	0.88
97	55	1.47	60	27.77	12.5	28	29	34	0.85
98	53	1.53	43	18.36	7.3	22	28	31	0.9
99	40	1.54	52	21.93	11	22.7	26	29	0.9
100	48	1.49	42	18.92	7.6	22	28	30	0.93
101	46	1.51	55	24.12	12	24	27	31	0.87
102	44	1.5	41	18.22	7.2	22	28	31	0.9
103	48	1.54	56	23.61	11.9	23.5	27	32	0.84
104	50	1.54	40	16.87	6.5	22	24	28	0.86
105	54	1.49	70	31.53	12.9	32	32	35	0.91
106	42	1.52	47	20.34	11.7	22.1	23	27	0.85
107	45	1.58	49	19.63	7.7	22.1	28	31	0.9
108	43	1.55	41	17.06	7.9	23	37	31	0.87
109	49	1.55	50	20.81	11.7	22.2	29	33	0.88
110	46	1.51	47	20.61	11.7	22.2	26	29	0.9
111	53	1.49	58	26.84	12.4	24.3	29	32	0.91
112	48	1.5	51	22.67	11.67	23	28	33	0.85
113	50	1.48	54	24.65	11.9	24	28	31	0.9
114	52	1.49	56	25.22	12.1	24.1	29	32	0.91
115	41	1.46	49	22.99	11.67	23	27	33	0.82
116	46	1.47	47	21.75	11.8	22.7	28	32	0.88
117	52	1.48	58	26.48	12.3	24.3	29	33	0.88
118	47	1.51	52	22.81	11.6	23	28	31	0.9
119	50	1.49	54	24.32	11.9	24	29	32	0.91
120	42	1.53	43	18.36	8.1	21	25	30	0.83
121	49	1.54	42	17.71	8.6	26	28	32	0.86
122	55	1.51	46	24.56	11.9	24	28	32	0.88
123	46	1.51	49	21.49	11.8	22.7	28	30	0.93
124	45	1.52	51	22.07	11.4	22.8	26	29	0.9
125	47	1.54	53	22.35	11.5	22.8	26	30	0.87

126	46	1.53	43	18.36	7.5	22	27	31	0.87
127	49	1.54	40	16.87	6.9	21.8	25	29	0.86
128	41	1.54	42	17.71	7.5	21.4	24	29	0.83
129	49	1.55	41	17.06	7.1	21.6	26	29	0.9
130	50	1.49	55	24.77	11.9	24	28	30	0.93
131	43	1.54	49	20.66	11.7	22.2	24	29	0.83
132	47	1.51	62	27.19	12.6	28	26	30	0.87
133	53	1.5	62	27.56	12.6	28	30	34	0.88
134	47	1.53	43	18.36	7.2	21	26	30	0.87
135	52	1.5	60	27.11	12.6	28	31	35	0.89
136	48	1.52	42	18.17	7.3	24	28	32	0.88
137	50	1.51	63	27.63	12.6	28	29	33	0.91
138	40	1.53	43	18.36	7.5	22	26	31	0.84
139	47	1.54	42	17.71	7.3	21.4	24	29	0.83
140	55	1.55	41	17.06	7.2	21.2	28	31	0.9
141	45	1.52	42	18.17	7.36	21.6	25	29	0.86
142	44	1.49	52	23.42	11.8	23.5	27	31	0.87
143	51	1.46	58	27.21	12.6	28	29	32	0.91
144	54	1.49	57	25.67	12.2	24.3	30	33	0.9
145	42	1.53	43	18.36	7.1	22	29	33	0.88
146	53	1.52	39	16.88	6.6	20	25	29	0.86
147	46	1.45	50	23.78	11.8	23.4	28	31	0.9
148	48	1.54	40	16.82	6.5	21.6	25	29	0.86
149	52	1.42	58	28.76	12.8	28.6	30	33	0.9
150	41	1.54	43	18.13	7.4	21.9	30	34	0.88
151	46	1.52	50	21.64	11.8	22.7	27	30	0.9
152	47	1.53	43	18.36	7.6	21.9	26	29	0.9
153	50	1.44	63	30.38	29	31.2	29	33	0.88
154	55	1.52	58	25.1	12.2	24.3	30	32	0.94
155	43	1.54	47	19.82	7.7	22.2	28	32	0.88
156	52	1.51	50	21.93	11.8	22.8	29	33	0.88
157	55	1.62	42	16.01	6.5	22.1	27	31	0.87
158	47	1.52	42	18.17	7.1	22.1	26	32	0.81
159	45	1.54	48	20.24	11.6	22.1	26	31	0.84
160	43	1.54	48	20.24	11.6	22.1	24	29	0.83
161	50	1.47	62	28.69	12.8	28.6	31	35	0.89
162	55	1.48	68	31.04	13	31.8	33	35	0.94
163	44	1.5	50	22.22	11.5	22.7	28	33	0.85
164	54	1.49	59	26.58	12.3	24.44	29	32	0.91
165	46	1.52	58	25.1	12.2	24.3	27	31	0.87
166	50	1.53	64	27.34	12.6	28	29	32	0.91
167	50	1.62	42	16.01	6.4	21.8	26	31	0.84
168	41	1.54	48	20.24	11.6	22.1	23	28	0.82
169	51	1.5	67	29.78	12.9	29.8	31	35	0.89
170	45	1.46	52	24.39	11.9	24	28	32	0.88

171	54	1.48	62	28.31	12.7	28.6	29	33	0.88
172	47	1.49	44	19.81	7.7	22.1	28	30	0.93
173	42	1.51	56	20.17	11	22.1	25	29	0.86
174	47	1.48	55	25.11	12.2	24.3	28	31	0.9
175	48	1.59	44	17.4	7.1	21.4	24	28	0.86
176	54	1.56	56	23.01	11.6	23.3	31	34	0.91
177	52	1.48	59	26.93	12.4	24.4	30	33	0.91
178	40	1.52	47	20.34	11	22.1	26	30	0.87
179	47	1.55	44	18.31	7.4	21.6	24	28	0.86
180	43	1.48	58	26.48	12.4	24.4	31	35	0.89
181	44	1.59	44	17.4	7.1	21	27	29	0.93
182	48	1.5	43	19.11	7.5	22	27	30	0.9
183	42	1.49	51	22.97	11.6	22.8	27	32	0.84
184	54	1.44	59	28.45	12.8	28.6	31	35	0.89
185	43	1.56	49	20.13	10.9	22.1	29	33	0.88
186	52	1.5	64	28.44	12.8	28.6	30	34	0.88
187	41	1.56	47	19.31	7.5	22	27	31	0.87
188	44	1.54	45	18.97	7.4	22	28	30	0.93
189	46	1.54	42	17.71	7.6	21.8	26	30	0.87
190	50	1.62	42	16.01	6.3	21.6	24	29	0.83
191	54	1.47	68	31.47	13.2	31.8	31	35	0.89
192	42	1.5	40	17.78	7.4	21.8	24	28	0.86
193	52	1.42	66	32.73	13.6	32.4	30	34	0.88
194	55	1.54	51	21.5	11.2	22.5	29	34	0.85
195	43	1.51	55	24.12	11.9	24	27	33	0.82
196	49	1.54	42	17.71	7.6	22	24	28	0.86
197	48	1.44	49	23.63	11.6	23.6	26	31	0.84
198	40	1.53	46	19.65	7.5	22	28	31	0.9
199	52	1.5	59	26.22	12.4	24.3	30	34	0.88
200	47	1.53	43	18.36	7.5	21.6	22	26	0.85
201	53	1.54	40	16.87	7.1	22	24	29	0.83
202	42	1.58	51	20.43	11	22.1	25	31	0.81
203	46	1.5	41	18.22	8	2.8	28	32	0.88
204	52	1.49	63	28.38	12.8	28.6	30	34	0.88
205	47	1.56	44	18.08	7.9	2.1	24	29	0.83
206	42	1.54	48	20.24	11	22.1	26	31	0.84
207	54	1.5	50	22.22	11.6	22.7	31	35	0.89
208	45	1.52	47	20.34	11	22.1	28	33	0.85
209	51	1.54	49	20.66	11	22.1	29	34	0.85
210	40	1.55	44	18.31	7.3	22	27	31	0.87
211	55	1.54	46	19.4	7.5	22	28	31	0.9
212	46	1.53	43	18.37	7.3	22	26	29	0.9
213	45	1.56	49	20.13	11	22.1	28	32	0.88
214	54	1.49	56	25.22	12.2	24.2	29	33	0.88
215	46	1.51	43	18.86	7.3	22	28	30	0.93

216	48	1.54	46	19.4	7.5	22	27	29	0.93
217	55	1.48	59	26.93	12.4	24.4	30	33	0.91
218	41	1.52	45	19.48	7.5	22	27	30	0.9
219	51	1.49	58	26.12	12.4	24.2	31	35	0.89
220	46	1.5	47	20.89	11	22.1	28	34	0.82
221	46	1.54	49	20.66	11	22.1	27	33	0.82
222	53	1.49	59	26.58	12.4	24.3	31	35	0.89
223	50	1.54	42	17.71	7.4	21.9	26	30	0.87
224	42	1.54	47	19.81	7.5	22	28	31	0.9
225	47	1.5	49	21.78	11.2	22.7	26	32	0.81
226	52	1.44	57	27.49	12.6	28	29	33	0.88
227	43	1.5	42	18.67	7.3	22	27	31	0.87
228	53	1.46	64	30.02	12.9	31.2	30	35	0.86
229	54	1.51	67	29.38	12.9	29.3	31	35	0.89
230	40	1.53	47	20.07	11	22.1	24	30	0.8
231	48	1.5	42	18.67	7.3	22	26	30	0.87
232	45	1.52	49	21.21	11.1	22.5	27	32	0.84
233	54	1.51	62	27.19	12.6	28	32	35	0.91
234	47	1.46	44	20.64	11	22	28	33	0.85
235	42	1.49	43	19.37	7.5	22	27	31	0.87
236	50	1.64	45	16.73	6.7	21	26	30	0.87
237	47	1.51	50	21.93	11.2	22.7	27	33	0.82
238	52	1.53	59	25.2	12.2	24.3	30	35	0.86
239	44	1.49	41	18.4	7.3	22	26	31	0.84
240	53	1.42	50	29.26	12.9	29.4	31	35	0.89
241	41	1.48	44	20.08	11	21.9	26	32	0.81
242	42	1.52	47	20.34	11	21.9	25	31	0.81
243	54	1.49	59	26.58	12.4	24.3	31	35	0.89
244	42	1.51	45	19.74	7.5	22	27	31	0.87
245	49	1.54	43	18.13	7.5	21.6	24	28	0.86
246	50	1.54	40	16.87	6.6	21.8	26	29	0.9
247	51	1.46	69	32.37	13.3	33	31	35	0.89
248	46	1.48	48	21.91	11.2	22.7	27	32	0.84
249	47	1.55	41	17.06	7.3	21.4	25	29	0.86
250	48	1.52	46	19.9	7.6	22.1	28	30	0.93
251	54	1.49	58	26.12	12.4	24.3	32	35	0.91
252	40	1.52	43	18.61	7.3	22	26	29	0.9
253	55	1.51	68	29.82	13	29.8	30	35	0.86
254	47	1.53	43	18.36	7.3	21.9	25	30	0.83
255	44	1.52	48	20.78	11	22.4	24	29	0.83
256	53	1.45	66	31.39	13.1	32	31	35	0.89
257	43	1.49	46	20.72	11	22.4	24	29	0.83
258	52	1.44	62	29.9	13	29.8	30	35	0.86
259	50	1.55	41	17.06	7.1	21.8	27	31	0.88
260	40	1.48	43	19.63	7.5	22.1	28	32	0.88

261	42	1.52	47	20.34	11	22.4	25	31	0.81
262	41	1.62	42	16.01	6.3	22.1	24	29	0.83
263	51	1.41	66	33.2	13.6	34	31	35	0.89
264	52	1.45	69	32.82	13.4	33.8	32	35	0.91
265	45	1.53	49	20.93	11	22.4	26	31	0.84
266	47	1.44	44	21.22	11.1	22.5	26	30	0.87
267	40	1.49	49	22.07	11.6	22.7	27	32	0.87
268	50	1.53	56	23.93	11.8	23.6	29	33	0.94
269	45	1.47	36	16.66	6.5	21	25	28	0.89
270	47	1.52	44	19.04	7.4	22	27	31	0.87
271	54	1.51	58	25.43	12.2	24.2	30	35	0.86
272	41	1.54	42	17.71	6.9	21.3	27	30	0.9
273	49	1.51	48	21.05	11.1	22.7	28	33	0.85
274	48	1.47	56	25.91	12.3	24	29	33	0.88
275	46	1.5	68	30.22	12.9	31.2	30	34	0.88
276	54	1.5	62	27.56	12.6	28	30	35	0.86
277	40	1.55	46	19.14	7.4	22	27	31	0.87
278	45	1.53	46	19.65	7.4	22	27	30	0.9
279	54	1.5	59	26.22	12.4	24.4	29	34	0.85
280	42	1.57	45	18.26	7.3	22	26	29	0.9
281	52	1.52	61	26.4	12.4	24.4	29	33	0.88
282	42	1.54	62	26.14	12.4	24.4	28	32	0.88
283	43	1.52	42	18.17	7.4	21.9	26	29	0.9
284	46	1.53	43	18.36	7.2	21.6	24	29	0.83
285	54	1.46	65	30.5	12.9	31.2	32	35	0.91
286	40	1.58	40	16.02	6.2	22	26	30	0.87
287	54	1.5	59	26.22	12.4	24.4	28	33	0.85
288	55	1.54	43	18.36	7.1	21.6	24	29	0.83
289	46	1.48	68	31.04	13.2	32	30	33	0.91
290	48	1.52	45	19.48	7.4	22	27	32	0.84
291	41	1.52	42	18.17	7.6	21.9	28	32	0.86
292	51	1.54	63	26.56	12.4	24.4	30	35	0.86
293	53	1.54	42	17.71	7.4	22	27	31	0.87
294	42	1.58	46	18.42	7.3	22	24	27	0.89
295	47	1.54	40	16.87	6.7	21	26	28	0.93
296	50	1.46	65	30.5	13	31.2	30	35	0.86
297	54	1.51	68	34.2	13.7	34.3	32	24	0.94
298	45	1.52	42	18.17	7.5	22.1	23	27	0.85
299	54	1.53	43	18.36	7.2	21.6	25	30	0.83
300	41	1.51	49	21.49	11.1	22.7	26	31	0.83

APPENDIX - X

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF AGRICULTURE, VELLAYANI
DEPARTMENT OF HOME SCIENCE

Haemoglobin, nutritional status index and energy balance of the respondents

Sl. No.	HB	NSI	Energy balance
1	8.4	823.83	2562
2	8.3	865.66	2875
3	7.6	848.74	2784
4	9.1	759.11	2632
5	9.3	841.61	2722
6	8.4	867.13	2602
7	8.7	820.03	2615
8	7.9	811.75	2664
9	7.9	825.00	2416
10	9.1	801.33	2861
11	8.8	877.06	1998
12	9.6	783.97	2994
13	8.4	865.52	2461
14	9.6	850.29	2674
15	9.4	782.58	2813
16	7.9	838.89	2310
17	8.7	783.37	2916
18	10.3	744.19	2939
19	8.9	821.29	2757
20	10.6	795.04	2613
21	9.4	823.78	2881
22	9.1	845.98	1970
23	7.9	749.85	2830
24	8.6	844.88	2537
25	11	789.85	2417
26	9.3	839.79	2364
27	8.5	859.89	2653
28	8.7	824.88	1899
29	8.9	820.34	2124
30	8.1	849.13	2465
31	10.1	797.03	2646
32	8.9	767.93	2926
33	11.2	823.40	2527
34	7.8	856.80	1974
35	7.9	829.27	2624

36	8.8	879.50	2001
37	10.4	862.81	2079
38	8.3	833.19	2632
39	8.3	845.30	3011
40	9.2	833.32	2496
41	8.7	803.78	2296
42	9.8	822.73	2296
43	7.9	813.66	2182
44	10.2	839.92	2894
45	9.1	820.12	2914
46	10.1	832.38	2174
47	9.1	800.12	2697
48	8.4	824.08	2926
49	7.4	813.03	2479
50	8.9	830.49	2267
51	8.6	856.46	2680
52	8.9	824.91	1993
53	8.2	813.90	2709
54	8.5	859.89	2166
55	8.9	831.71	2441
56	10.2	789.88	1981
57	7.4	823.49	3004
58	7.8	823.23	2531
59	8.7	834.69	2418
60	10.1	781.33	2447
61	9.6	845.47	2617
62	8.9	831.63	2070
63	7.5	805.35	1967
64	9.4	769.80	2761
65	8.7	805.77	2029
66	11.5	834.80	2547
67	8.4	800.28	2396
68	9.1	820.02	2526
69	10.7	815.41	2943
70	8.9	857.81	2276
71	9.6	846.97	2320
72	8.4	785.25	2624
73	10.1	812.28	2454
74	9.3	825.80	2463
75	7.6	813.19	2763
76	7.7	823.60	2382
77	8.7	831.10	2862
78	8.9	784.39	2461
79	10.3	797.72	2305
80	8.4	805.66	2776

81	10.6	795.78	2067
82	11.3	813.44	2514
83	8.9	825.34	2882
83	8.1	824.59	2276
84	10.7	790.08	2356
85	7.9	818.93	2832
87	8.2	803.68	2589
88	9.6	825.62	2764
89	9.1	799.82	2062
90	8.7	803.08	2598
91	10.9	811.60	3554
92	7.9	804.48	2853
93	8.9	800.12	1836
94	8.4	832.04	2563
95	7.6	835.43	2354
96	12	797.72	2596
97	10.6	792.54	2656
98	8.7	820.24	2478
99	8.9	825.51	2633
100	7.5	798.25	2485
101	10.3	811.98	3014
102	8.9	804.69	2653
103	10.3	827.60	2493
104	8.6	823.92	2514
105	12.4	805.66	2621
106	8.7	813.93	2341
107	7.7	845.71	2166
108	8.3	832.20	2456
109	7.9	831.30	2149
110	9.4	810.21	2495
111	11.8	803.19	2242
112	9.8	806.56	2607
113	9.4	795.58	2641
114	11.2	802.64	2734
115	9.6	785.30	2806
116	8.9	789.94	2621
117	11.6	797.99	2359
118	12.3	813.35	3115
119	10.4	801.96	2675
120	9.1	819.81	2603
121	8.9	826.29	2946
122	11.3	812.80	2936
123	8.7	810.32	2365
124	10.2	816.12	2682
125	9.2	826.02	2735

126	9.1	820.39	2629
127	8.7	824.41	2661
128	8.9	824.44	2602
129	9.1	830.15	2878
130	12.1	802.72	2572
131	10.9	826.70	2658
132	9.7	811.44	2106
133	11	808.75	2157
134	8.7	819.58	2189
135	11.3	809.33	2174
136	8.9	815.52	2685
137	9.4	812.36	2265
138	10.7	821.45	2538
139	8.9	824.42	2115
140	8.7	830.58	2748
141	8.9	814.19	2908
142	11.7	802.32	2711
143	11.2	787.39	2764
144	9.7	801.89	2849
145	9.1	821.10	2652
146	8.9	813.92	2519
147	12.2	781.97	2526
148	8.4	824.11	3003
149	10.2	766.18	2596
150	9.1	826.73	2812
151	10.7	816.92	2154
152	9.1	819.82	2611
153	9.1	777.92	2537
154	10.2	817.77	2872
155	7.9	825.15	2063
156	10.1	812.19	2263
157	9.1	867.25	2066
158	9.1	815.11	2581
159	8.8	825.78	2489
160	7.8	824.25	2928
161	10.8	793.38	2944
162	9.4	798.26	2178
163	8.4	805.41	2962
164	9.6	801.49	2996
165	9.6	816.55	2442
166	9.1	822.39	2238
167	8.9	866.87	2505
168	12.2	827.29	2750
169	10.6	809.07	2703
170	9.7	785.53	2849

171	9.6	796.90	2366
172	8.9	799.39	2954
173	12.1	812.15	2357
174	9.4	795.65	2113
175	8.8	850.26	2319
176	7.4	836.86	2654
177	9.9	796.89	2704
178	12.3	817.79	2609
179	8.7	829.35	2571
180	9.3	796.98	2014
181	8.2	850.51	2647
182	7.9	803.60	2835
183	10.6	801.56	2312
184	9.1	776.35	2327
185	8.4	836.79	2561
186	9.2	807.45	2297
187	10.9	837.51	2692
188	8.7	825.31	2918
189	8.9	825.06	2273
190	8.6	865.85	2528
191	10.8	793.78	2068
192	9.1	803.52	3011
193	10.6	767.21	2344
194	8.4	826.63	2496
195	10.3	812.15	2563
196	8.7	824.16	2319
197	10.1	774.72	2948
198	7.7	819.53	2632
199	10.6	808.06	2652
200	8.9	818.30	2551
201	8.6	824.18	2601
202	8.9	846.53	2241
203	9.1	803.53	2517
204	12	804.39	2794
205	8.8	833.27	2515
206	8.8	825.71	2495
207	11.1	808.47	2746
208	9.3	816.40	2458
209	10	827.79	2621
210	7.8	829.81	2584
211	10.4	826.85	2631
212	10.3	820.73	3101
213	8.9	836.81	2214
214	10.1	801.99	2157
215	9.6	810.31	2639

216	11.1	826.82	2424
217	9.5	796.58	2128
218	8.7	814.69	2261
219	11.3	803.74	2526
220	9.1	805.99	2352
221	11.2	828.16	2569
222	9	801.97	2362
223	9.1	825.20	2673
224	8.8	825.62	2673
225	11.4	807.13	2016
226	9.3	775.65	2391
227	10.1	805.46	2231
228	11	788.38	2791
229	10.2	813.94	2596
230	8.2	819.44	2797
231	9.3	804.46	2905
232	9.7	816.40	2346
233	12.1	815.39	2689
234	9.9	785.49	2996
235	8.4	798.96	2552
236	8.8	877.06	2148
237	9.4	811.18	2569
238	11.3	824.44	2625
239	8.5	798.79	2216
240	11.6	767.81	2814
241	9.1	794.73	2567
242	8.9	815.12	2175
243	12	804.31	2458
244	9	809.89	2761
245	8.9	824.28	2569
246	8.7	824.56	2673
247	11	788.84	2874
248	11.7	797.09	2487
249	8.9	829.81	2761
250	8.7	814.91	2798
251	12	804.48	2943
252	8.8	814.34	2641
253	11.6	814.91	2126
254	8.6	819.40	2158
255	9.2	814.84	2178
256	11.3	783.70	2910
257	8.9	798.92	2425
258	9.4	776.56	2211
259	9.1	830.74	2622
260	11.4	796.46	2061

261	8.2	814.62	2585
262	8.7	865.97	2318
263	9.9	761.96	2919
264	9.1	782.41	2412
265	9.3	820.91	2165
266	8.4	772.98	2291
267	9.7	800.82	2166
268	8.9	821.85	2649
269	8.6	787.41	2494
270	9	815.09	2357
271	9.4	812.49	2375
272	9.1	825.27	2693
273	8.9	810.94	2196
274	9.4	791.00	2155
275	11.2	809. 2896	2235
276	9	807.38	2956
277	9.3	831.01	2741
278	8.4	819.68	2168
279	11.1	808.27	2214
280	9.5	841.02	2949
281	9.1	816.99	2841
282	9.7	827.54	2553
283	9	814.48	2784
284	8.7	819.06	2276
285	9.3	787.45	2807
286	8.4	845.37	2439
287	8.9	806.18	2721
288	8.7	824.27	2756
289	9.6	797.51	2623
290	10.7	816.62	2744
291	9.8	816.08	2185
292	9.6	828.42	2562
293	8.9	825.43	2582
294	8.6	844.79	2644
295	8.1	823.84	2537
296	9.7	787.40	2814
297	11.4	813.49	2183
298	8.9	813.49	2361
299	9.1	819.75	2350
300	11.2	811.99	2457

APPENDIX - XI

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Schedule used for food weighment survey

Name of the meal	Menu	Weighment method			
		Weight of total raw ingredients (g)	Weight of the total cooked food consumed by the family (g)	Amount of cooked food consumed by the respondent (g)	Raw equivalent used by the individuals (g)
Breakfast					
Lunch					
Tea					
Dinner					
Others					

NUTRITIONAL PROFILE OF MIDDLE AGED WOMEN OF BELOW POVERTY LINE (BPL) FAMILIES WITH SPECIAL REFERENCE TO MICRONUTRIENTS

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Abstract of the
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ABSTRACT

Middle-aged women are totally ignored from all nutritional intervention programmes even though they are more prone to major micronutrients deficiencies like iron, vitamin A and iodine deficiencies. Inspite of several micronutrients deficiency diseases, middle aged women are also affected by certain degenerative diseases such as hypertension, arthritis, diabetes mellitus, coronary artery diseases, osteoporosis, cancers, obesity, etc., which often contribute to loss of life, lack of independence and self confidence. At this juncture studying the health, nutritional profile and micronutrient status, in particular of middle aged women belonging to below poverty line families is highly significant.

Three hundred women subjects belonging to the age group of 40-55 years from Neyyattinkara Taluk, were selected from the Below Poverty Line (BPL) survey list of Govt. of Kerala (1991). The subjects from the BPL survey list were selected through stratified multistage random sampling technique.

Oral questionnaire was used as a tool to conduct survey to find out the socio-economic, health and dietary pattern of the subjects.

Socio-economic survey carried out revealed that 82.00 per cent of the subjects belonged to Hindu community, and nuclear type families were found to be more popular in the areas surveyed. It was found that adult population contributed 59.40 per cent, while child population was less when compared to adults. Families studied had comparatively more number of females than males with a sex ratio of 1000:1083. Employment status of the population showed that 28.40 per cent of male and 69.60 per cent of females were unemployed.

Details related to the most important economic problems ranked on a priority basis showed that of the various economic problems listed, lack of permanent employment was the most important problem they faced.

Socio economic survey carried out revealed that presence of an alcoholic, drug addict, family belonging to scheduled caste, family with one or no adult employed, family with no access to safe drinking water were the four major risk factors identified on priority basis.

Age wise distribution of the subjects showed a gradual increase in the number of women, when the age increases from 40-55 years. Educational status of the women showed that 8.33 per cent were illiterates. In the present study 50.67 per cent of middle-aged women were employed. Health problems when enumerated in general revealed the fact that skin diseases followed by arthritis, osteoporosis, diabetes mellitus and hypertension were prevalent among the subjects. Reproductive health problems mainly repeated abortions, irregular menstruation, uterine problems and problems associated with menopause were noticed among majority of the subjects under study. Study revealed that 59.67 per cent of the subjects were suffering from severe stress and strain.

Food expenditure pattern for various consumables revealed that families food expenditure was primarily controlled by the purchase of cereals followed by fish, food outside home, milk and milk products, nuts and oil seeds, other vegetables, root and tubers. Use of various food items by the subjects showed that energy rich foods were used daily, whereas protective and body building foods were rarely used by the subjects. Low intake of micronutrients rich foods especially fruits; green leafy vegetables and animal foods were also observed. Intake of all food items were marginally low than their respective RDA except root and tubers. Assessment of the nutrient intake revealed that the diet was inadequate in calories, protein, calcium, iron, vitamin C, vitamin A and thiamine.

The overall anthropometric data reveals the fact that middle-aged women living below poverty line had poor body parameters for weight, height, skin fold thickness, waist and hip circumference compared to their

normal standards. A negative energy balance was obtained when the mean energy intake of 2218.00 K cals compared with the energy expenditure of 2563.00 K cals, which could lead them in wasting of muscles. Sixty six per cent of subjects were having heamoglobin level below 12 g/dl, which is an indicative of anaemia. It was found that anaemia, vitamin A deficiency disorders, iron deficiency, B vitamin deficiency are seen among the subject.

Based on these data the Nutritional Status Index was developed. It was observed that 61.00 per cent of the subjects were having a low NSI, which is indicative of the poor nutritional status of middle aged BPL women. Based on the Nutritional Status Index developed from the macro sample, 15 women having highest NSI and 15 women with lowest NSI were selected to study the micronutrients profile of the subjects. Detailed biochemical investigation was carried out to assess the bioavailable β-carotene, iron and iodine in food and blood drawn from the selected micro samples. In case of iodine, urinary iodine was subtracted from the dietary iodine to assess the available serum iodine.

In depth study revealed that adequacy of nutrients in the diet consumed by the subjects was inadequate with respect to their RDA, irrespective of their nutritional status. The mean dietary intake of β-carotene for women, having low and high NSI was 643.88μ g/day and 645.86μ g/day respectively. Bioavailability of β-carotene from the diet was only17.62 per cent for high index group and 17.14 per cent for low index group.

Mean dietary iron was found to be 12.68 mg/day and 14.57 mg/day for low and high NSI groups respectively. Bioavailability of iron from the diet was also noted to be very low with a mean of 0.48 mg/day for low NSI groups and 0.53 mg/day for high NSI groups. Serum iron seems to be in the range of 14.79 mg/dl to 70.62 mg/dl with a mean of 52.81 mg/dl for low and 57.46mg/dl for high NSI groups.

Dietary adequacy of iodine revealed a range between 75.51-156.20 μg/d. Urinary iodine was found to range from 67.76 μg/ L to 146.48 μg/L, with a mean value of 111.35 μg/L for low index group and 113.40μg/L for high index group. The serum iodine content was 8.54μg/d for low NSI group and 9.79 μg/d for high NSI group.

Correlation studies carried out showed that a highly significant correlation was present between iron, β- carotene and vitamin-C, showing the mutual necessity of these vitamins in the diet. The haemoglobin level of the subjects was found to be positively correlated with the serum β-carotene and serum iron.

Various methods of assessment cleared out that the subjects under study do not project a good nutritional status. The sample showed deficit in anthropometric measurements with poor heamoglobin level and possessing many of the nutritional deficiency symptoms and consumed a diet inadequate in quantity and quality. Micronutrients profile studies conducted among the population clearly indicated that dietary intake of all nutrients were below the recommended levels and found no significant difference between the high and low NSI groups within the below poverty level middle-aged women. The result revealed that majority of the women did not possess normal values as far as the β- carotene, iron, and iodine were concerned. This leads to the confirmation that poor dietary micronutrients intake coupled with poor bioavailability with special reference to β- carotene, iron and iodine would have all contributed to the incidence of micronutrients deficiency diseases among middle-aged women.

The finding provides base line information for developing nutritional intervention programs for middle-aged women.

Based on the findings the following recommendations for further tudy have been brought out.

- Research study can be conducted to see the influence of diet in degenerative diseases among middle-aged women.
- A comparative research study can be conducted between middle-aged women in high and low economic strata.
- Nutritional profile of middle-aged women with special reference to macronutrients could be studied.
- RDA for middle-aged women could be developed.