FOOD SECURITY IN FARM LABOUR HOUSEHOLDS OF KUTTANAD

By

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "**Food security in farm labour households of Kuttanad**" is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.

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ABBREVIATIONS

BMI	Body Mass Index
BMR	Basal Metabolic Rate
CED	Chronic Energy Deficiency
FAO	Food and Agriculture Organisation
HCC	Head and Chest Circumference
ICMR	Indian Council of Medical Research
IFAD	International Fund for Agricultural Development
LIC	Life Insurance Corporation
MSSRF	M.S. Swaminathan Research Foundation
MUAC	Mid Upper Arm Circumference
NIN	National Institute of Nutrition
NIRD	National Institute of Rural Development
NNMB	National Nutrition Monitoring Bureau
PCA	Principal Component Analysis
PDS	Public Distribution System
POST	Parliament Office of Science and Technology
RDA	Recommended Dietary Allowances
USCB	United States Census Bureau
USDA	United States of Department of Agriculture
VCD	Versatile Compatible Disk
WHO	World Health Organisation
%	Per cent
mg	Milli gram
µg	Micro gram
g	Gram

INTRODUCTION

1. INTRODUCTION

"Food security, if not adequately addressed, will become an issue of national insecurity." – Dr. Chelston Brathwaite, Director General, IICA

Food is one among the basic needs of life. Since ages food in Indian culture has played a great role. We find a whole hymn in praise of food in the *Rig-Veda* and food was regarded as the source of all life. "We are what we eat" is an old proverb. Our nutritional status, health, physical and mental wellbeing depend on the food we eat and how we eat it.

The issue of food security has been with us since time immemorial. Its importance has recently gained both domestic and global focus, because, the concept and its implementation encompasses implied strategies going beyond food production.

According to FAO (1996) food security implies a situation that exists when all people at all times have sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food security includes ready availability of adequate amount of food, which is nutritionally adequate, safe and balanced.

The concept of food security has been under going an evolutionary change during the past ten years. In the 1950's food security was considered essentially in terms of production and it was assumed that adequate production will ensure availability of food in the market as well as in the household. However, later, it was proven that availability alone will not lead to food security and that physical availability alone will not ensure economic access which is also needed to procure essential food items.

Food security of a population in general has been considered at global, regional, state, household and individual levels. Inspite of the substantial progress made in India's food production, serious nutritional challenges threaten the progress of our country. Though there is 'food for all' the biggest challenge facing the nation is to ensure 'food to

all' to achieve food security. Food security at the household level remains a challenge mainly due to low purchasing power and lack of accessibility to a variety of foods by most of the people. Nutritionally inadequate diet among the households coupled with the male biased intra household food distribution and lack of care for the nutritionally vulnerable members especially women and children will lead to widespread nutritional disorders. Thus, food security is one of the several conditions necessary for the population to be healthy and well nourished.

It has been categorically announced that labour households account for a large proportion of the food insecure population. Agricultural labourers, who are the real producers of foods shoulder the multiple burden of under employment, poverty, under nutrition and food insecurity.

Apart from these, large population in some pockets living in harsh and difficult terrain is encapsulated with several physical, economic and technical constrains. Kuttanad, which is called as the 'rice bowl of Kerala' is the lowest region of India with 500 square kilometers of the region below sea level and most of the area is covered with water throughout the year. It is one of the few cultivated places in the world where farming is carried out below sea level. Agricultural labourers are one of the important work forces in Kuttanad.

Hence, an attempt has been made to find out the food security of farm labour households of Kuttanad with the following objectives.

1. To assess the extent of food security in the farm labour households of Kuttanad.
2. To study the factors influencing food security in the farm labour households.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

The literature relevant to the study entitled "Food security in farm labour households of Kuttanad" is reviewed in this chapter under the following headings.

2.1. Dimensions of food security

2.2. Factors affecting food security

2.3. Food and nutritional security of labour households

2.1. Dimensions of food security

The term food security originated in International development literature in the 1960s and 1970s. Early definitions focused almost exclusively on the ability of a region or nation to assure an adequate food supply for its current and projected population. The concept evolved since then and used at global, regional, national, community, household or individual levels. The focus on community, household and individual levels of food security were considered relevant to public health approaches (Cook, 2008).

According to World Bank (1986) definition, food security is adequate access to food for all people at all times for an active healthy life. According to Christensen (1991), food security is obtained when there is an adequate supply to which all members of the population have full access. Klein (1996) indicated that food security consisted mainly of anxiety about having enough food to eat or running out of food and having no money to purchase more.

Food security for a household means access by all members at all times to enough food for an active, healthy life and includes at a minimum the ready availability of nutritionally adequate and safe foods, and an assured ability to acquire acceptable foods in socially acceptable ways that is without resorting to emergency food supplies, scavenging, stealing, or other coping strategies (USDA, 1996)

According to Hamilton *et al. (*1997) food security is the access for all people, all the time to enough food for an active and healthy life as well as the immediate availability of adequate and safe food, acquired by socially acceptable ways. Annes and Manfred (1997) viewed food security as the ability of a household to produce a stable and sustainable basket of adequate food. Food security is defined as physical, economic and social access to balanced diet, clean drinking water, environmental hygiene and primary health care (Swaminathan, 2010a).

The three major dimensions of food security are food availability, food access and food absorption (Anderson *et al.*, 1999 and MSSRF, 2001). Planning Commission viewed food security as the eradication of hunger and starvation by ensuring availability, accessibility and affordability of balanced food and nutrition to all people of the country especially the underprivileged (NNMB, 2002).

M. S. Swaminathan Research Foundation (MSSRF, 2003) indicated food security as strengthening the livelihood security of all members within a household by ensuring both physical and economic access to balanced diet including the needed micronutrients, safe drinking water, environmental sanitation, basic health care and primary education.

According to Rai and Rai (2007), food security at the national level means that there is satisfactory balance between the food demanded and the food supplied in the country at reasonable prices. A family is considered as food secure, if its entitlements for food are greater than its needs and an individual is considered to be food secure, if his or her food consumption is greater than the need.

International Fund for Agricultural Development (IFAD, 1997) suggested both long-term and short-term aspects of food security. Food security analysts also classified two general types of food insecurity namely chronic and transitory food insecurity. According to IFAD (1997) when a household is persistently unable to meet the food requirements of its members over a long period of time, chronic food insecurity occur.

The short-term problem may afflict any household, regardless of whether it has a chronic problem or not. Crop failure, seasonal scarcities, temporary illness or unemployment among the productive members of the household or perhaps an emergency need for large cash expenditure reduce the household's access to food and results in transitory food insecurity.

Transitory food insecurity could be further divided into temporary and cyclic or seasonal food insecurity (Thomson and Metz, 1996). According to the authors, temporary food insecurity occurs when sudden and unpredictable shocks, such as drought, flood, pest attacks or sudden unemployment affect the household's entitlements. Seasonal food security occurs when there is regular pattern of inadequate access to food. Food and Agricultural Organisation (1998) indicated that the concept of seasonal food insecurity falls between chronic and transitory food insecurity.

According to Athreya *et al.* (2008) food insecurity is a dynamic concept, a household may be food insecure in the present or in the future or both which may be examined in terms of present and potential food insecurity, where potential food insecurity can occur either due to a potential lack of livelihood or a potential threat of disease and lack of absorption.

2.2. Factors affecting food security

Vijayaraghavan *et al.* (1998) indicated non ownership of agricultural land, lower agricultural production, low per capita income and illiteracy as the factors influencing household food security. Lupien and Menza (1999) indicated that in addition to problem of food supply, access to basic services like education, health facilities, sanitation, clean water, safe housing and employment affect food security.

Adhiguru and Ramaswamy (2003) observed that household food security stems from inadequate employment, low income, seasonal migration, high food prices,

geographic and seasonal misdistribution of food, poor social organisation and large family size. Vijayan (2003) indicated inadequate cultivable land, expenditure pattern, lack of nutrition education and inability to make use of available resources as the major factors influencing food security. Lawrence (2003) indicated food expenditure, monthly income, family size and type of family as the important factors influencing food security. Vijayakumar *et al.* (2007) considered low purchasing power and lack of accessibility of a variety of foods as the factors influencing food security.

The full story of food insecurity is related to poverty, illiteracy, gender discrimination, caste discrimination, neglect, unhygienic living conditions, lack of basic amenities and health care (MSSRF, 2001). Seven most frequently cited chronic drivers of household food insecurity were found to be poverty, lack of education, unavailability of employment, poor market access, increase in food price, failure in poverty right and climate or environment (Scholes and Biggs, 2004). The authors also indicated that the first five drivers acted by restricting access to food and the last two acted via reduction in food production.

As per Parliamentary Office of Science and Technology (POST, 2006) factors such as poverty, health, food production, political stability, infrastructure, access to markets, and natural hazards affect food security. Per capita aggregate production, cattle ownership, fertiliser application and access to irrigation were found to have a positive effect on household food security (Sikwela and Mpuzu, 2008). Shapouri and Rosen (2010) indicated current trends in agricultural production, income, population growth, and inflow of foreign capital as the factors affecting food security.

Ayinde *et al.* (2006) indicated that the nature of food security worsened by the low level of formal education, income and farm productivity (Swaminathan, 2010b). Livelihood security as an essential and inseparable component of a comprehensive strategy for national food security was indicated by Gupta (2009). A safe environment,

prevention of transmission of vector-borne diseases and equitable health care were reported to be the elements promoting nutrition security for every individual.

United States Census Bureau (USCB, 2000) and Bukuluki *et al.* (2008) observed more food insecurity among the elderly and the disabled. However, Croome *et al.* (2007) indicated high food insecurity in the households with young children and in female headed households. Hadley *et al.* (2008) observed more food insecurity among girls when compared to boys. Ramachandran (2008) and Floro and Swain (2010) indicated less food security among women when compared to men and children due to gender bias.

Gender discrimination in food distribution was observed in the Indian households by Basu *et al.* (1993) and MSSRF (2000). Quisumbing *et al.* (1995) considered women as the key to household food security. IFAD (2004) indicated that at any given income level, a household is likely to enjoy more food security when there is control over income for women. Gender blindness and lack of women empowerment were considered by FAO (2008) and Wanner (2009) as the factors influencing food security.

According to Ajula *et al.* (1993), Selvaraj and Jayaprakashan (2001) and Priscilla *et al.* (2002) poverty is a major determinant of chronic household food insecurity. NIRD (1999) reported that larger the number of poor, lower would be their access to food and higher would be their food insecurity and vulnerability. MSSRF (2001) indicated poverty as an important cause for persistent food insecurity.

Household's real income is an important factor influencing food security as income limits the amount of food which can be obtained (Dewalt *et al.*, 1990, VonBraun and Lorch, 1991 and Sheikh, 2007). Bonti-Ankomah (2001) observed higher vulnerability to food security in households with low income. Viswanath (2001) reported that increased income as well as income from diversified sources as important factors to

achieve long term food security especially among rural women. According to Tarasuk (2001) household food security is inextricably linked to financial insecurity.

Access to health service and food provision was found to be affected negatively in low income families (Piaseu and Mitchell, 2004). Petersen (2004), Nyanguru (2005a and 2005b) observed improved access to basic human needs in the households with income security. Sheikh (2007) indicated food prices as an important factor influencing food security.

According to Nolan *et al.* (2006) food security is strongly and independently associated with the capacity to save money.

Basic education among rural people was considered as a key factor for promoting over all food and nutritional security (Swamy *et al.*, 2000, Tessio *et al.,* 2005 and Burchi, 2006). According to Rajikabandari and Smith (2000) female education had an impact on the consumption of nutritious and preferred foods that was independent of the effect of income. Hoffmann *et al.* (2009) also indicated the impact of education in reducing poverty, hunger and food insecurity

Haddad (1999), Mukudi (2003) Simister (2003) and Mehrota (2006) stressed the influence of parental education in achieving nutritional security among children.

Large family size would result in improper food distribution among family members due to low purchasing power (Thimmayamma, 1983). Yesoda (1990) reported that family size along with the composition of the family would affect the availability and access to food which directly affect household food security. VonBraun and Lorch (1991) observed larger family size with younger age composition and dependants in food insecure households. Sikwela and Mpuzu (2008) also indicated significant relationship between household food security with the size of the households.

Farm size was considered as an important factor influencing food accessibility through household income (Najafi, 2003). A negative and significant relationship between farm size and household food security was indicated by Sikwela and Mpuzu (2008).

According to Devereux (2000) drought and war are the main triggers of transitory food insecurity. The author also indicated seasonality as a major cause of cyclical food insecurity while structural factors contributing to chronic food insecurity included poverty, fragile natural resource base, weak institutions and unhelpful or inconsistent government policies. Rosegrant and Cline (2003) indicated climate change as a critical factor affecting food security. Gregory *et al.* (2005) observed labour issues and the availability and quality of ground water for irrigation as factors influencing food security.

2.3. Food and nutritional security of labour households

A study conducted by Vijayaraghavan *et al.* (1998) in the backward areas of Orissa indicated that only eight per cent of the households had food security with respect to all food groups. Prema (2001) studied the extent of food security among the households below poverty line in Kerala and identified households of labourers, small scale entrepreneurs in informal sector, urban poor and those residing in low potential areas as at risk. Nnakwe and Yegamma (2002) observed high percentage of food insecurity in the households with children. Vijayan (2003) in a case study conducted among the agricultural labourer families of Kalliyoor panchayat of Trivandrum District of Kerala observed food insecurity in all the households.

In a study conducted by Kumra *et al.* (2003) on food and nutritional security in relation to food availability, access and absorption, food shock among the poor households of relocated colonies of Delhi was observed due to loss of employment. Lawrence *et al.* (2005) reported better food security among the households of women

agricultural labourers working in the organised sector mainly due to their better purchasing power. The authors also indicated food insecurity without hunger and with moderate hunger in the agricultural labour households of unorganized sector. Ayinde *et al.* (2006) observed highest level of food insecurity among the female preschoolers compared to other members in the farming households of Nigeria. Vijayakumar *et al.* (2007) reported food insecurity with moderate hunger among Adi Dravidar women of Salem District of Tamil Nadu. A study conducted in the three backward tribal dominated Districts of Orissa, Panda and Sarangi (2010) observed severe food insecurity and hunger among the population. The authors also indicated severe and moderate forms of hunger among 90 per cent of households and the rest 10 per cent of the households had manageable form of hunger. Moyal and Kohli (2011) in a study conducted among elderly in Ajmer city indicated food security among 80 per cent of the households.

Rekha *et al.* (2007) indicated gross nutritional insecurity among tribal expectant mothers of Ranchi District of Jharkand. The authors also reported nutritional insecurity among hundred per cent women with respect to calcium, fat, iron, and beta carotene and more than 90 per cent were found to be insecure with respect to energy and protein. The intake of all foods except cereals and other vegetables were found to be lower than the RDA.

A study conducted by Roy (1991) among the tea garden workers of North Bengal observed frequent occurrence of iron deficiency anaemia among women than male workers. Cherian (1992) and Augustine (1993) indicated iron deficiency anaemia among the agricultural labourers and women engaged in stone breaking in Thiruvananthapuram District. Seralathan *et al.* (1993) reported severe anaemia among 16 percent of farm women in Coimbatore District. Vasanthi *et al.* (1994) studied the iron nutritional status of adolescent girls in the households of rural agricultural labourers and observed anaemia among 22 per cent girls. Udaya (1996) and Smitha (1999) reported anaemia among 60 percent of women engaged in agricultural occupations of Thrissur District. Kapil *et al.* (1999) indicated iron deficiency anemia among 4.8 per cent pregnant women belonging

to urban slums of Delhi. Rajkumar and Premakumari (1999 and 2000) observed high prevalence of anaemia among male workers of different occupational sectors in Coimbatore. Ranganathan (1996) observed anaemia among 85 per cent of women coir workers in Thiruvananthapuram District. Farzana and Manay (2000) and Singh and Bagba (2001) observed anemia among 24 per cent women in the rural areas of Karnataka. Ramya and Devaki (2000) reported increasing degrees of anaemia associated with deficient intake of iron, vitamin C, protein and energy among construction workers in Tirupathi.

Mathruvalli *et al.* (2002) indicated 32.12 percentage of anaemia among women in urban slums of Madurai District. Jyothi (2003) also indicated anaemia among 63.33 per cent of women labourers involved in rice cultivation in Palakkad District of Kerala. Bentley and Griffiths (2003) indicated different degrees of anaemia among 69 per cent of women in Andhra Pradesh.

National Institute of Nutrition (NIN, 2007) indicated 89.2 per cent prevalence of anaemia among non pregnant non lactating women of Kerala and 75.2 per cent prevalence in India. Yenagi *et al.* (2007) indicated mild to moderate anaemia among 72 per cent of rural women entrepreneurs involved in food processing activities of Dharwad District. Patil *et al.* (2009) observed anaemia among 41 per cent of women in Maharashtra. Deepa (2009) observed mild to moderate anaemia among 85 per cent and 70 per cent of women coir workers of unorganized and organized sectors respectively. Panghal and Boora (2010) also reported anaemia among 78 per cent of pregnant women belonging to the BPL families of Hissar District of Haryana. In a study conducted by Kabeer *et al.* (2011) among workers of a plastic industry of Hyderabad reported anaemia leading to reduced work out put among 58 per cent of the workers.

Karuna and Prema (1993) observed different grades of energy deficiency among 33 per cent of women engaged in fish vending in Thiruvananthapuram District. Ranganathan (1996) conducted a study among coir workers in Thiruvananthapuram District and

reported that 60 per cent of the women had different degrees of energy deficiency. Udaya (1996) and Smitha (1999) also observed different grades of energy deficiency among farm women of Thrissur District.

Different grades of Chronic Energy Deficiecy (CED) were noticed among 49 per cent of women in West Bengal (NIN, 2002). Jyothi (2003) reported various grades of CED among 43.33 per cent of women agricultural labourers of Palakkad District. Lawrence (2003) also reported various grades of chronic energy deficiencies among 21 to 32 per cent women agricultural labourers. Chakraborty and Bose (2008) indicated CED among 63.9 per cent adult male tribals involved in agriculture. Deepa (2009) reported different grades of CED only among 12 per cent and 8 per cent of women coir workers in the organized and unorganized sectors respectively.

A study conducted by Glawe *et al.* (2008) among rural adults indicated first degree CED among 20 per cent men and 16 per cent women. The authors also observed higher percentage of malnutrition among young adults between the age group of 20 to 24 years when compared to 35 to 39 years. A study conducted by Khanam *et al.* (2011) among rural women in Varanasi indicated chronic energy deficiency among 12.5 per cent of women.

A study conducted by Bansal and Mehta (1989) among workers of brick industry in Hissar observed deficient intake of various food groups and nutrients. Sujatha (1990) revealed that most of the labourers engaged in stone breaking had diets inadequate in all the food groups except roots and tubers and fish. Sreenivasan *et al.* (1991) and Dungarwal and Choudhry (2001) reported deficient energy intake among the low income groups of Tamil Nadu and the farm labourers of Agriculture Research Station, Rajastan respectively. Sar *et al.* (1991) indicated calorie deficiency among 53 per cent of women in the rural households of Maharashtra and 30 per cent of the households had protein deficiency. Prameshwaran and Unnikrishnan (2000) reported that in Tamil Nadu the

landless labour households consuming less than 2300 Kcal per day constituted about 77 per cent of the total rural households.

Studies conducted by Narayana and Sathiya (2004) indicated lower calorie intake among women textile workers when compared to home makers. Shobha and Sheela (2004) indicated lower intake of most of the food groups and nutrients among women participating in sericulture technologies of Karnataka. Yenagi *et al.* (2007) reported lower energy and protein intake among women entrepreneurs involved in food processing activities in Dharwad District. A study conducted by Soniya and Vijayanchali (2011) among women workers of cashew factories of Kanyakumari District indicated deficits in calories, calcium, iron and vitamin C in their diet. However, the intake of protein and fat was found to be excess. Health and nutritional profile of workers in a latex industry located at Kanyakumari District conducted by Krishna and Thangaleela (2011) indicated that the diet consumed by the workers were inadequate and lack in protective foods.

Clinical manifestation of vitamin B complex deficiencies were observed among 29 per cent of agricultural labourers of Thiruvananthapuram District (Cherian, 1992). Yegammai and Ambili (1992) also indicated clinical manifestations of B complex deficiencies among women belonging to the fisherfolk families of Alleppy District. Augustine (1993) also observed B complex deficiency symptoms among 8 to 9 per cent of women engaged in stone breaking.

Devi and Sarojini (2000) indicated clinical manifestations of vitamin B complex deficiencies among 41 percent of women engaged in dairy and non dairy industries. Mohapatra *et al.* (2001) indicated angular stomatitis, cheilosis and glossitis among 29 per cent labourers of Kalahandi District of Orissa. Angular stomatitis was observed among 6 to 18 percent women agricultural labourers of Thrissur (Lawrence, 2003) and Thiruvananthapuram Districts (Vijayan, 2003). However, Ramlath (2007) noticed B complex deficiencies among 50 - 61 per cent male and female members of fisher folk families of Thiruvananthapuram District.

Sahu *et al.* (2009) observed high prevalence of vitamin D deficiency among pregnant women and adolescent girls in a rural North Indian community. Kapil *et al.* (1999) reported iodine deficiency disorder among 22.9 per cent of pregnant women in Shadnagar block of Andhra Pradesh. However, Griffiths and Bentley (2001) indicated goitre prevalence among 18 per cent of adult women. Patil *et al.* (2002) observed high prevalence of water borne diseases among rural agricultural labourers.

Taneja and Sexena (1998) in their study among Bhil women of Madhya Pradesh reported malnutrition among 95 per cent women and only 2.72 per cent had normal grades of BMI. Rajkumar and Premakumari (1999 and 2000) observed high prevalence of underweight among male workers of different occupational sectors in Coimbatore. Mild to moderate forms of malnutrition was observed among women construction workers in Namakkal District (Saraswathi and Renuka, 2004). Yenagi *et al.* (2007) indicated malnutrition among 25 per cent of women involved in food processing activities in Dharwad District. A study conducted by Kabeer *et al.* (2011) among the workers of a plastic industry in Hyderabad, indicated under nutrition among 30 per cent of the workers.

Laxmaiah (2002) documented under nutrition among 50 per cent of rural preschool children of Punjab on the basis of weight for age. The author indicated stunting and wasting respectively among 60 per cent and 12 per cent of children on the basis of height for age and weight for height. Hari (2008) reported poor nutritional status among preschool children belonging to tribal and non tribal communities of Northern Kerala. The author also indicated that the mean food and nutrient intake of children were significantly lower than the RDA irrespective of gender. Bains and Brar (2009) observed moderate and severe forms of under nutrition among 27 and 6 per cent preschool children belonging to farm families of Punjab. Beek and Mishra (2011) indicated high prevalence of malnutrition among children of tribal farmers of Orissa.

Pradhan and Sharma (2011) also reported 69.3 per cent under weight, 63.4 per cent stunting and 58.7 per cent wasting among tribal children of Madhya Pradesh. A study conducted by Kumar *et al.* (2011) among preschool children in Bihar reported under nutrition among 52 per cent of children in which 22 per cent were found to be severely undernourished.

Patil *et al.* (2009) studied the health problems of adolescent girls in Maharashtra and concluded that 2/3 [rd] of subjects were undernourished.

MATERIALS AND METHODS

3. MATERIALS AND METHODS

This chapter presents the methods and procedures followed in various phases of the study and the details are presented under the following sections.

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3.1.   Selection of the area

3.2.   Selection of sample

3.3.   Plan of study

3.4.   Methods adopted for the study

3.5.   Development of tools and conduct of the study

3.6.   Analysis of the data

3.1. Selection of the area

The study was conducted in Kuttanad area of Kerala. Kuttanad, also known as the "The Rice Bowl of Kerala" is the lowest region in India, with 500 square kilometres of the region below sea level. It is one of the few places in the world where farming is carried out below mean sea level. Kuttanad is famous because of its paddy fields and farmers are dedicated to the growth of paddy. Most of the area in Kuttanad will be covered with water throughout the year. Kuttanad is spread over eighteen panchayats or village groups belonging to the districts of Alappuzha, Pathanamthitta and Kottayam in seven agro ecological zones namely Upper Kuttanad, Lower Kuttanad, North Kuttanad, Coastal Kuttanad, Kayal, Purakkad and Vaikom. All these seven agro ecological zones of Kuttanad were selected for the study.

3.2. Selection of sample

From each of the seven agro ecological zones selected, 20 farm labour households in which at least one adult member is an agricultural labourer and the major income of

the household is from farm labour were selected randomly for the study. Thus, a total of 140 households were selected for the study from Kuttanad.

For conducting the detailed study, four women in the age group of 25-50 years and four preschool children in the age group of 3 to 5 years were selected from separate households from each of the agro ecological zones. Thus, a total of 28 women and 28 preschool children were selected as subsample from seven agro ecological zones of Kuttanad.

3.3. Plan of study

Based on the objectives, the plan of study was designed. The study comprised of

3.3.1. A base line survey to collect relevant data on the socioeconomic status of the households.

3.3.2. A dietary survey to collect the food consumption pattern of the households.

3.3.3. Dietary recall survey to collect information on the food adequacy of the households and to compute the food intake per consumption unit and per capita nutrient intake.

3.3.4. Food purchase inventory for a period of 15 days

3.3.5. Assessment of nutritional status of the family members through

3.3.5.1. Anthropometric measurements

3.3.5.2. One day food weighment survey to assess the actual food and nutrient intake of women and preschool children (subsample).

3.3.5.3. Clinical examination of women and preschool children (subsample) to identify the deficiency symptoms.

3.3.5.4. Biochemical examination of blood of women (subsample) for haemoglobin.

3.3.6. Measurement of household food security.

3.3.7. Statistical analysis and interpretation of data using suitable statistical techniques.

3.4 Methods adopted for the study

Determination of suitable methods and procedures are very important to get accurate and reliable data. Interview method with the help of structured and pretested schedules was used to collect the required information on the socioeconomic status and food consumption pattern of the households.

To assess the food adequacy, three day recall method of diet survey was conducted among the selected households and food intake per consumption unit and per capita nutrient intake were computed.

Food purchase inventory for a period of 15 days was conducted to find out the frequency of purchase of various food items and the quantity of food purchased by the households.

To assess the nutritional status of family members, following methods were employed.

1. Recording of anthropometric measurements.
2. Monitoring actual food and nutrient intake.
3. Conducting clinical examination.
4. Estimating haemoglobin level of blood.

Weight and height of all family members were recorded using standard procedures suggested by Jelliffe (1966). Among preschool children, apart from height and weight, mid upper arm circumference, head circumference and chest circumference were also recorded. In order to assess the Chronic Energy Deficiency (CED) among adolescents, adults and elderly, Body Mass Index (BMI) was computed using the formula.

$$BMI = Weight\ (kg)\ /\ Height\ (m^2)$$

To assess the actual food and nutrient intake of women and preschool children (subsample) one day food weighment survey was conducted. Clinical examination of women and preschool children (subsample) was conducted to assess the signs and symptoms associated with nutritional deficiencies. Haemoglobin content of blood was estimated among women (subsample) to find out the prevalence of anaemia.

To assess the household food security, the modified version of the food security scale suggested by United States Department of Agriculture (USDA, 2000) was used. Food security of the households was also assessed by measuring the access, availability and utilization of foods.

3.5. Development of tools and conduct of the study

3.5.1. Socioeconomic and food consumption pattern of the households

Tools are certain instruments, which are used in research for gathering new facts. To collect information regarding the socioeconomic and food consumption pattern of the households, two interview schedules were prepared. The schedule to find out the socio - economic conditions of the households comprised of information pertaining to the type of family, distribution of family members according to age and sex, education and occupational status of family members, size of land holdings, crops cultivated, monthly income, per capita income, monthly expenditure pattern, details on indebtedness and savings, personal habits, housing and living conditions, health facilities available in the locality and morbidity pattern. The schedule used to collect the socioeconomic details of the households is given in Appendix I.

The schedule to find out the food consumption pattern of the households included details on meal pattern, frequency of use of foods, food expenditure pattern and preservation and storage practices adopted by the households and food purchase inventory for 15 days. This schedule also included details on dietary recall survey for

three days to find out the food adequacy of the households. The schedule is given in Appendix II.

The frequency of use of different food items among the households was assessed by computing the frequency scores using the formula suggested by Reaburn *et al* (1979). The formula is given below:

Percentage of total score = $\dfrac{R_1S_1 + R_2S_2 +\text{---------}R_nS_n}{n}$

S_n = Scale of rating, R_n = Percentage of respondents selecting a rating, n= Maximum scale rating.

To conduct the household food purchase inventory, the inventory schedule was kept in the custody of an educated member of each household for 15 days. These nominated members recorded the details of food purchased by the households on a daily basis. Details such as the nature of item purchased and quantity per purchase were recorded in the inventory schedule. Mean quantity of different food items purchased by the households for a day was computed from the data collected and compared with the mean requirement for different food items. The RDA suggested by ICMR (2010) for different groups was taken into account to compute the requirement of each household.

To conduct the recall method of diet survey, standard measuring cups, spoons and a weighing scale were used to estimate the quantity of food consumed by the households. The respondents recalled the details of the raw food items selected during the preceding three days and also the quantity of each item in cup measurements which was converted into grams. From the data collected, the quantity of each food item used by the households per consumption unit was computed and represented in terms of food intake per consumption unit. Then, the mean food intake of the households was computed and compared with the quantity of each food group required for a balanced diet suggested by ICMR (2010) for an adult man engaged in moderate activity.

From the quantity of food stuffs used by the households for three days, the nutritive value of food stuffs was computed using the food composition table suggested by Gopalan *et al.* (1989) and the mean nutrient intake of the households was expressed in terms of per capita nutrient intake and compared with the Recommended Dietary Allowances for nutrients suggested by ICMR (2010) for an adult man engaged in moderate activity.

3.5.2. Assessment of nutritional status

3.5.2.1. Anthropometric measurement

The anthropometric measurements like weight and height of all family members were measured using standard procedures suggested by Jelliffe (1966). For adults, adolescents and children who can stand, weight was recorded using a bathroom balance, which was checked for calibration with standard weights and was expressed in kilo gram. The weight of infants and children who cannot stand, the weight was recorded using a beam balance.

Height was measured using a fiberglass tape. The subject was asked to stand straight without slippers, with the heels, buttocks, shoulder and occiput against the wall. The height was recorded in centimeters. For infants and children who cannot stand as well as elderly, the crown heel length in the lying position was measured instead of standing height using the tape and expressed in centimeters.

BMI of adolescents, adults and elderly was computed on the basis of weight and height measurements of the respondents and were categorized into different groups using the cut off levels suggested by James *et al.* (1988) and Luizz *et al.* (1992).

Mid upper arm circumference of children was measured with a flexible fibre glass tape. The measurement was taken in the left arm while hanging freely at its mid point

between the tip of the acromion process of the scapula and the olecranon process of the ulna as suggested by Jelliffe (1966).

Height and weight of family members and MUAC of children were compared with the standard measurements suggested for the respective age and sex and the results were interpreted. For children below five years, reference standards suggested by WHO (2006) for weight and height was taken for comparison. For all other age groups, the reference weight and height suggested by NNMB (2002) was taken to interpret the results. The MUAC of children was compared with the standards suggested by Gopaldas and Seshadri (1987).

Head circumference of children below five years was measured using a fiberglass tape, placing the tape firmly round the frontal bones just superior to the supra orbital ridges, passing it round the head at the same level on each side and laying it over the maximum occipital prominence at the back as suggested by Jelliffe (1966). The measurement was expressed in centimeter.

Chest circumference of children below five years was also taken using the fiberglass tape. The measurement was taken at the nipple line during mid inspiration as suggested by Jelliffe (1966) and expressed in centimeter.

Taking the head and chest circumference measurements, head/chest circumference ratio was computed.

3.5.2.2. Food weighment survey

To conduct one day food weighment survey among the subsample, the investigator weighed the raw foods included in the meal for a day as well as the cooked weight of each preparation. The amount of cooked food consumed by the respondents (women and preschool children) was also weighed, and also the plate wastage to get the

exact amount of foods consumed. Any other extra food consumed was also taken into account. All these measurements were recorded using standard measuring cups and spoons and also by means of a food weighing balance. The amount of cooked food item consumed by the respondents was then converted to its raw equivalent. The nutritive value of the foods consumed was computed using food composition tables (Gopalan *et al.,* 1989). The mean food and nutrient intake of women and preschool children were compared with the Recommended Dietary Allowances (RDA) suggested by ICMR (2010)

3.5.2.3. Clinical examination

Clinical examination of the subsample was conducted with the help of a qualified physician using a schedule formulated for this purpose and the schedule is given in Appendix III.

3.5.2.4. Estimation of haemoglobin

Haemoglobin level of blood among women (subsample) was estimated using cyanmethaemoglobin method suggested by Raghuramulu *et al.* (2003).

3.5.3. Assessment of household food security

To measure the household food security, the food security scale prepared by USDA (2000) was modified slightly and the modified version was used to collect the relevant information. The food security core-module questionnaire (Appendix IV) covers the full range of severity observed under current conditions for households both with and without children. Each household's response to each of the questions in the food security core module is coded as either affirmative or negative. Then, the number of affirmative responses was calculated.

The set of food security questions included in the core survey module is combined into a single overall measure called the food security scale. This is a continuous, linear scale which measures the degree of severity of food insecurity/hunger experienced by a household in terms of a single numerical value ranging from 0 to 18. The food security scale values and status level classifications were determined using the reference standard values suggested by USDA (2000). The details are given in Appendix V. Both the scale value and the status level classification of each household depended on the number of affirmative answers the respondent has given and whether the household has children.

Scale value and type of food security were determined by selecting the column corresponding to the total number of affirmative answers responded by the households. For example, if a household with children gives six out of 18 affirmative answers, that household is assigned a scale value of 3.9 and classified as food insecure without hunger.

The food security of each of the selected households was also ascertained by selecting the important determinants which influence the access, availability and utilisation of foods. From access, factors such as family size, monthly income and monthly expenditure incurred for the purchase of foods were taken into consideration and an index was developed through Principal Component Analysis (PCA).

Quantity of different foods purchased by the households and the quantity of the different foods consumed per consumption unit by each of the households were taken to assess the food availability. To assess the quantity of foods purchased, the data collected using the food purchase inventory of the households for fifteen days was used. The quantity of cereals, pulses, vegetables, fruits, milk and milk products, fats and oils, flesh foods etc. purchased by the households for fifteen days were converted into monthly figures and these monthly figures were again reparameterised in terms of monitory value. For this, the cost of each food item per kilogram at Kuttanad was considered and the cost was computed based on their standard of purchase and an index was developed.

To assess the consumption, the intake of different food items per consumption unit determined using the three day recall method of dietary survey was taken into consideration and were converted into a single index for each household by taking in to account the frequency of use of different food items.

To assess the utilization, the per capita intake of nutrients namely energy, protein and iron among the households which was computed from the quantity of food consumed per consumption were taken into account and the index was developed through PCA.

All these three indices namely access, availability and utilisation of foods were again fused into a single figure by summing up. Then, the quartiles of these indices were found out to determine the food security status.

The relationship if any between the prevalence of malnutrition and food security was also determined by taking into consideration the total number of malnourished individuals in the households and the food security score developed using USDA (2000) module. The numbers of malnourished individuals in the households were computed on the basis of the anthropometric data taken for each of the family members. For this, adolescents, adults and elderly who had a BMI less than $18.5 kg/m^2$ (undernourished) were categorized as malnourished. For children in the age group of 0 to 5 years and 6 to 12 years, the weight for age and height for age classification computed as per Gomez *et al*. (1956) and Warterlow (1972) respectively were considered. Children who obtained less than 90 per cent of the standards for weight for age and less than 95 per cent of the standards for height for age were categorized as malnourished. These three criteria's were considered to find out the number of malnourished individuals in the households. Total number of malnourished members in the household and the food security score obtained for each of the household were again fused individually as binary measures, zero indicating malnourished/food insecure and one indicating normal nutritional status/food secure as the case may be.

3.6 Statistical analysis

Statistical analysis was carried out using percentage analysis, t test, correlation analysis, multinomial logistic regression, and Principal Component Analysis (PCA) to analyse the observations.

RESULTS

4. RESULTS

The results of the study entitled "Food security in farm labour households of Kuttanad" are presented in this chapter under the following sub headings;

1. Socioeconomic profile of the households.
2. Food consumption pattern of the households.
3. Food adequacy of the households.
4. Nutritional status of family members.
5. Food security of the households.

4.1. Socioeconomic profile of the households

The socioeconomic profile of the households was studied with special reference to their religion, type of family, family size, composition of the household, education and occupational status of family members, monthly income, percapita income, monthly expenditure pattern, details of loan, savings, total land holdings, cultivation of crops, possession of domestic animals, kitchen garden, housing and living conditions, personal habits, health facilities in the locality and morbidity pattern.

4.1.1. Religion, type of family and family size

Details of religion, type of family and family size are presented in Table 1.

The table reveals that majority of the households (90%) belonged to Hindu community. About 9.29 percent of the households were found to be Christians.

In the study area, nuclear family system was noticed among 55 per cent of the households and the rest were found to be joint families.

Table 1. Details regarding religion, type of family and family size

S.No.	Details	Number of households	Per cent
1	**Religion**		
	Hindu	126	90.00
	Christian	13	9.29
	Muslim	1	0.71
	Total	140	100
2	**Type of family**		
	Joint	63	45.00
	Nuclear	77	55.00
	Total	140	100
3	**Family size**		
	1-3	18	12.86
	4-6	111	79.29
	7-9	11	7.85
	Total	140	100

Regarding the family size, it was found that 79.29 per cent had 4 to 6 members and 12.86 per cent of the households were having up to three members. Rest of the households (7.85%) had 7 to 9 members.

4.1.2. Composition of the households

Details of the distribution of family members in the selected households on the basis of age and sex are given in Table 2. It was found that 46.99 per cent of the total population was in the age group of 20 to 49 years and comprised 47.31 per cent male and 46.70 per cent female members. The members aged 50 years and above comprised 22.14 per cent and constituted 19.04 per cent male and 24.93 per cent female members. Children below 10 years were found to be 17.47 per cent of the total population which comprised 17.78 per cent boys and 17.19 per cent girls.

Table 2. Distribution of family members on the basis of age and sex

Sex / Age (years)	Male	Female	Total
0-10	56 (17.78)	60 (17.19)	116 (17.47)
11-19	50 (15.87)	39 (11.18)	89 (13.40)
20-29	43 (13.65)	57 (16.33)	100 (15.06)
30-39	53 (16.83)	55 (15.76)	108 (16.27)
40-49	53 (16.83)	51 (14.61)	104 (15.66)
50-59	26 (8.25)	33 (9.46)	59 (8.89)
>60	34 (10.79)	54 (15.47)	88 (13.25)
Total	**315 (100)**	**349 (100)**	**664 (100)**

(Figures in the parentheses are percentage)

4.1.3. Educational status of family members above 18 years

The educational status of family members above 18 years of age is presented in Table 3. Among 217 male and 255 female members above 18 years of age in the study area, 47.92 per cent of male and 37.25 per cent of female members had studied up to high school level. Only 1.84 per cent male and 4.71 per cent female members were found to be

illiterate. Among the illiterate members majority were found to be above 60 years. None of the female members above 45 years of age had college level education. However, 14.75 per cent male and 10.59 per cent female members attained college level of education.

Table 3. Educational status of family members above 18 years of age

Age (Years) Education	18-45		45-60		>60		Total	
	M	F	M	F	M	F	M	F
Lower primary	9 (7.32)	4 (2.50)	9 (15.00)	14 (34.15)	15 (44.12)	28 (51.85)	33 (15.21)	46 (18.04)
Upper primary	9 (7.32)	22 (13.75)	20 (33.33)	17 (41.46)	7 (20.59)	8 (14.82)	36 (16.59)	47 (18.43)
High school	71 (57.72)	79 (49.38)	26 (43.34)	9 (21.95)	7 (20.59)	7 (12.96)	104 (47.92)	95 (37.25)
Higher secondary	8 (6.50)	28 (17.50)	-	-	-	-	8 (3.69)	28 (10.98)
College	26 (21.14)	27 (16.87)	5 (8.33)	-	1 (2.94)	-	32 (14.75)	27 (10.59)
Illiterate	-	-	-	1 (2.44)	4 (11.76)	11 (20.37)	4 (1.84)	12 (4.71)
Total	**123 (100)**	**160 (100)**	**60 (100)**	**41 (100)**	**34 (100)**	**54 (100)**	**217 (100)**	**255 (100)**

(Figures in the parentheses are percentage)   M- Male.   F - Female

4.1.4. Educational status of children and adolescence

Details regarding the educational status of children and adolescents are given in Table 4. It was observed that among children below five years, 51.61 per cent boys and 54.29 per cent girls were attending balwadies. All children in the age group of 6 to 10 years had lower primary education. Majority of boys (87.50%) and girls (77.78%) in the age group of 11 to 15 years were found to be attending upper primary classes. It could be seen that in the case of boys and girls in the age group of 16 to 17 years, 60 per cent boys and 85.71 per cent girls had undergone high school education and the rest 40 per cent boys and 14.29 per cent girls completed higher secondary education

Table 4. Educational status of children and adolescents

Age (Years) Education	0-5		6-10		11-15		16-17		Total	
	B	G	B	G	B	G	B	G	B	G
Not started studies	15 (48.39)	16 (45.71)	-	-	-	-	-	-	15 (15.31)	16 (17.02)
Balwadi	16 (51.61)	19 (54.29)	-	-	-	-	-	-	16 (16.33)	19 (20.21)
Lower Primary	-	-	25 (100)	25 (100)	-	-	-	-	25 (25.51)	25 (26.60)
Upper primary	-	-	-	-	28 (87.50)	21 (77.78)	-	-	28 (28.57)	21 (22.34)
High school	-	-	-	-	4 (12.50)	6 (22.22)	6 (60)	6 (85.71)	10 (10.20)	12 (12.77)
Higher secondary	-	-	-	-	-	-	4 (40)	1 (14.29)	4 (4.08)	1 (1.06)
Total	**31 (100)**	**35 (100)**	**25 (100)**	**25 (100)**	**32 (100)**	**27 (100)**	**10 (100)**	**7 (100)**	**98 (100)**	**94 (100)**

(Figures in the parentheses are percentage)   B - Boys   G-Girls

4.1.5. Occupational status of family members

The details on the occupational status of the family members are given in Table 5. Out of the total population above 18 years, 71.89 per cent male and 54.51 per cent female members were working as agricultural labourers. About 20.74 per cent male and 45.49 per cent female members were not having any work. Among agricultural labourers, majority of the male and female members were found to be below 60 years of age.

Table 5. Occupational status of family members

Age (Years) Occupation	18-45		45-60		>60		Total	
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Agricultural labourer	88 (71.55)	103 (64.37)	56 (93.34)	28 (68.29)	12 (35.29)	8 (14.81)	156 (71.89)	139 (54.51)
Boat driver	1 (0.81)	-	-	-	-	-	1 (0.46)	-
Private job	12 (9.76)	-	2 (3.33)	-	-	-	14 (6.45)	-
Army	1 (0.81)	-	-	-	-	-	1 (0.46)	-
No work	21 (17.07)	57 (35.63)	2 (3.33)	13 (31.71)	22 (64.71)	46 (85.19)	45 (20.74)	116 (45.49)
Total	**123 (100)**	**160 (100)**	**60 (100)**	**41 (100)**	**34 (100)**	**54 (100)**	**217 (100)**	**255 (100)**

(Figures in the parentheses are percentage)   M- Male   F- Female

4.1.6. Monthly income of the households

From Table 6, it can be seen that 75 per cent of the households earned an income up to rupees 4000 per month. About 20.71 per cent of the households indicated that they received a monthly income in between Rs.4000 to Rs.6000 and only 4.29 per cent of the households received an income in the range of Rs.6000 to 10000 per month.

Table 6. Monthly income of the households

Income (Rs)	Number	Per cent
<2000	7	5.00
2000- 4000	98	70.00
4000- 6000	29	20.71
6000- 8000	4	2.86
8000- 10000	2	1.43
Total	**140**	**100**

4.1.7. Per capita income of the households

The details on the per capita income of the households are given in Table 7. It could be seen that the per capita income of 51.43 per cent of the households was in between Rs. 501 to Rs.750 and 27.87 per cent had Rs. 751 to Rs. 1000 as per capita income. Only 7.85 per cent had a per capita income below Rs 501 and 12.85 per cent of the households had above Rs. 1001 as per capita income.

Table 7. Per capita income of the households

Per capita income (Rs)	Number	Per cent
<250	3	2.14
251-500	8	5.71
501-750	72	51.43
751-1000	39	27.87
1001-1250	8	5.71
1251- 1500	7	5
>1500	3	2.14
Total	**140**	**100**

4.1.8. Monthly expenditure pattern of the households

Details pertaining to the monthly expenditure pattern of the households on food, clothing, health, transport, fuel, education and electricity are depicted in Table 8.

It is clear that 50.71 per cent of the households spent above 55 per cent of their income for food while 32.14 per cent spent 40 to 55 per cent of their income on food.

Majority of the households spent less than 10 per cent of their monthly income for clothing (96.43%), transport (82.15%), fuel (80%), education (63.57) and electricity (92.15%). Twenty to 35.72 per cent of the households did not spend any money for health, fuel and education.

4.1.9. Indebtedness

From the study, it was found that 35 per cent of the households availed loans. Among these, 55.10 per cent availed loan for agricultural purpose and 14.29 per cent and 16.33 per cent took loan for marriage and house construction respectively. Rest of the households availed loan for education (8.16%) and for the purchase of domestic animals (4.08%) and vehicles (2.04%).

The amount of loan varied from Rs.10,000 to Rs.50,000 among 51.02 per cent of the households and 20.41 per cent availed less than Rs. 10000/. It was also seen that most of the households (57.14%) borrowed money from co operative banks and the rest (42.86%) from nationalised banks. The details of the source, purpose and amount of loan taken by the households are presented in Table 9.

Table 8. Monthly expenditure pattern of the households

Per cent of monthly income spent	Food	Clothing	Health	Transport	Fuel	Education	Electricity
0	-	-	37 (26.43)	-	28 (20)	50 (35.72)	-
<5	-	20 (14.29)	13 (9.29)	16 (11.43)	63 (45)	43 (30.71)	24 (17.15)
5-10	-	115 (82.14)	53 (37.86)	99 (70.72)	49 (35)	46 (32.86)	105 (75)
10-15	-	4 (2.86)	20 (14.29)	24 (17.14)	-	1 (0.71)	10 (7.14)
15-20	-	1 (0.71)	14 (10)	1 (0.71)	-	-	1 (0.71)
20-25	-	-	1 (0.71)	-	-	-	-
25-30	2 (1.43)	-	1 (0.71)	-	-	-	-
30-35	7 (5)	-	-	-	-	-	-
35-40	15 (10.72)	-	1 (0.71)	-	-	-	-
40-45	10 (7.14)	-	-	-	-	-	-
45-50	34 (24.29)	-	-	-	-	-	-
50-55	1 (0.71)	-	-	-	-	-	-
>55	71 (50.71)	-	-	-	-	-	-
Total	**140 100)**	**140 (100)**	**140(100)**	**140 (100)**	**140 (100)**	**140 (100)**	**140 (100)**

(Figures in the parentheses are percentage)

Table 9. Details of loan taken by the households

Details	Number of households	Per cent
Loan taken	49	35
Nil	91	65
Total	140	100
Purpose of loan		
Agriculture	27	55.10
Marriage	7	14.29
House construction	8	16.33
Education	4	8.16
Domestic animals	2	4.08
Vehicle	1	2.04
Total	**49**	**100**
Amount (Rs.)		
< 10,000	10	20.41
10,000-20,000	8	16.33
20,000-30,000	13	26.53
30,000-40,000	1	2.04
40,000-50,000	3	6.12
>50,000	14	28.57
Total	**49**	**100**
Source		
Co operative bank	28	57.14
Nationalised bank	21	42.86
Total	**49**	**100**

4.1.10. Possession of land

The details on the possession of land and the area available for each household are given in Table.10. It was seen that only 35.71 per cent of the households owned land and 70 per cent of them had up to 100 cents of land.

Table 10. Details regarding possession of land

Details	Number of households	Per cent
Own land	50	35.71
No land	90	64.29
Total	**140**	**100**
Area (acre)		
< 50 cent	17	34.00
50 -100 cent	18	36.00
100-150 cent	7	14.00
>150 cent	8	16.00
Total	**50**	**100**
Cultivation		
Paddy	35	70
Banana	8	16
Vegetables	7	14
Total	**50**	**100**

4.1.11. Possession of domestic animals and kitchen garden

Among 140 households surveyed, only 55 per cent of the households had domestic animals (Table 11). Among the households who owned domestic animals, only 58.44 per cent of the households received income from domestic animals.

Most of the households (65.71%) had kitchen garden and utilised the produce for their own use and none of the households received any income from kitchen garden.

Table 11. Details regarding domestication of animals

Details	Number of households	Per cent
Domestic animals present	77	55.00
Not present	63	45.00
Total	**140**	**100**
Receiving income	45	58.44
No income	32	41.56
Total	**77**	**100**

4.1.12. Savings

About 92.14 per cent of households had the habit of saving money and most of these households (40.85%) had savings in LIC. Rest of the households had savings in bank account and investments in chitty too. The details are presented in the Table 12.

Table.12. Details about saving money

Details	Number of households	Per cent
Saved money	71	50.71
No saving	69	49.29
Total	**140**	**100**
Mode of savings		
LIC	29	40.85
Bank	19	26.76
Bank and LIC	18	25.35
Chitty	3	4.22
Chittyand LIC	2	2.82
Total	**71**	**100**

4.1.13. Housing and living conditions

Details on the housing and living conditions are presented in Table 13. Majority of the households (97.14%) had own houses, and 70 per cent of them were of brick walled. Metal sheet (62.14%) was used as the roofing material in most of the houses. Majority of the houses (67.86%) used cement as the flooring material. Nearly 87.15 per cent of houses had two to four rooms. Lavatory facilities were not present in 47.14 per cent of the houses. Majority (97.86%) of the houses had electricity facilities. None of the houses have drainage facilities.

Most of the households (75.71%) owned radio, television, mobile or VCD for recreation. About 71.43 per cent depended on back waters as the source of drinking water and the rest (28.57%) used water from public tap for drinking. Nearly 88.57 per cent of the households used bus for transport. Only 22.14 per cent of the households subscribed news paper.

4.1.14. Details regarding personal habits

Details regarding personal habits of the members of households are furnished in Table 14. It was seen that in 50 per cent of the households, the family members especially adult men had the habit of smoking, alcohol consumption and tobacco chewing.

4.1.15. Health care facilities in the locality

All the households depended on primary health centre for medical facilities. All the households used allopathic medicines for treatment. Most of these facilities were present within a distance of 1 to 2 km.

4.1.16. Morbidity prevalent in the locality

The most important epidemic prevalent in the locality were reported to be different types of fever like chikungunia, dengue fever and viral fever, diarrhoea, measles and jaundice. Among these diseases, 46.63 per cent and 29.29 per cent of the households suffered from fever and diarrhoea. Measles was affected among 20.71 per cent of the households and 5.71 percent suffered from jaundice.

Table 13. Housing conditions of the families

S. No.	Housing conditions	Number of households	Per cent
1	**Type of house**		
	Own	136	97.14
	Rented	4	2.86
	Type of wall		
2	Stone	25	17.85
	Brick	98	70.00
	Wood	7	5.00
	Mud	6	4.29
	Thatched	4	2.86
3	**Roofing material**		
	Tiled	28	20.00
	Sheet	87	62.14
	Wooden plank	7	5.00
	Concrete	6	4.29
	Thatched	11	7.86
	Ceiling	1	0.71
4	**Floor**		
	Tiled	6	4.29
	Cement	95	67.86
	Wood	1	0.71
	Mud	37	26.43
	Sand	1	0.71
5	**No. of rooms**		
	1	3	2.14
	2	35	25.00

	3	56	40.00
	4	31	22.15
	5	12	8.57
	>5	3	2.14
6	**Lavatory facilities**		
	Present	74	52.86
	Absent	66	47.14
7	**Electricity**		
	Present	137	97.86
	Absent	3	2.14
8	**Drainage facilities**		
	No drainage	140	100
9	**Recreational facilities**		
	Radio/Television/Mobile	13	9.29
	TV/Mobile	64	45.71
	TV	3	2.14
	Radio/Mobile	3	2.14
	VCR/TV/Mobile	4	2.86
	TV/Radio	4	2.86
	Mobile	14	10
	Mobile/Radio/TV/DVD	1	0.71
	Absent	34	24.29
10	**Separate rooms**		
	Absent	140	100
11	**Source of drinking water**		
	Back waters	100	71.43
	Public tap	40	28.57

12	Transport facilities		
	Bus	124	88.57
	Cycle and bus	15	10.72
	Country boat and bus	1	0.71
13	Printed media		
	News paper	31	22.14
	NIL	109	77.86

Table 14. Personal habits of family members

Personal habits	Number of households	Per cent
Smoking	13	9.29
Alcohol consumption	9	6.43
Smoking and alcohol	7	5.00
Smoking and tobacco chewing	3	2.14
Smoking, tobacco chewing and alcohol consumption	38	27.14
Nil	70	50.00
Total	**140**	**100**

4.2. Food consumption pattern of the households

The food consumption pattern of the households was assessed with respect to the food habits, meal pattern, frequency of use of foods, food expenditure pattern, preservation and storage of food items adopted by the households and food purchase inventory for 15 days. The details are given from 4.2.1 to 4.2.6.

4.2.1. Food habit

All the households were found to be non-vegetarians and used rice as their staple food.

4.2.2. Meal pattern

The analysis of the meal pattern of the households indicated that all households followed three meals a day pattern. None of the households planned their meals in advance.

Regarding specific time schedule for taking meals, it was observed that all the households took food when they were hungry or according to their convenience.

Details regarding consumption of raw foods and left over foods, it was seen that none of the households consumed raw foods on a regular basis. However, they used left over food items mainly *conjee*. None of the households consumed food from outside. About 59.29 per cent cooked meals thrice in a day.

4.2.3. Frequency of use of food items

The details on the frequency of use of various food items are furnished in Table 15. It is clear that all households used cereals and fats and oils daily. Pulses, vegetables and fish were used thrice in a week by 24.29 per cent, 53.57 per cent and 47.85 per cent of households respectively. Majority (62.14%) of the households used roots and tubers once in a week. The frequency of use of fruits and leafy vegetables was found to be once in a week among 40.71 per cent and 57.15 per cent of the households respectively. About 28.57 per cent of the households used fish daily.

Nearly 64.28 per cent and 50 per cent of the households included meat and egg occasionally in their diet.

Table 15. Frequency of use of different food items

Food items	Daily	W₃	W₂	W₁	Monthly	Occasionally	Total
Cereals	140 (100)	-	-	-	-	-	**140 (100)**
Pulses	1 (0.71)	34 (24.29)	63 (45)	41 (29.29)	1 (0.71)	-	**140 (100)**
Leafy vegetables	-	4 (2.86)	24 (17.14)	80 (57.15)	31 (22.14)	1 (0.71)	**140 (100)**
Roots and tubers	-	4 (2.86)	36 (25.71)	87 (62.14)	13 (9.29)	-	**140 (100)**
Vegetables	10 (7.14)	75 (53.57)	48 (34.29)	7 (5)	-	-	**140 (100)**
Fruits	-	8 (5.71)	31 (22.14)	57 (40.71)	31 (22.14)	13 (9.29)	**140 (100)**
Milk and milk products	10 (7.14)	1 (0.71)	1 (0.71)	22 (15.72)	42 (30)	64 (45.72)	**140 (100)**
Fish	40 (28.57)	67 (47.85)	21 (15)	4 (2.86)	4 (2.86)	4 (2.86)	**140 (100)**
Meat	-	-	-	6 (4.29)	44 (31.43)	90 (64.28)	**140 (100)**
Egg	-	-	7 (5)	4 (2.86)	59 (42.14)	70 (50)	**140 (100)**
Fats and oils	140 (100)	-	-	-	-	-	**140 (100)**

(Figures in the parentheses are percentage)

W₃- Weekly thrice. W₂ - Weekly twice. W₁ - Weekly once.

The frequency of use of different food items among the selected households was assessed by the formula suggested by Reaburn *et al.* (1979) and the percentage score obtained is presented in Table 16. The results indicated that the maximum score of 100 per cent was obtained only for cereals and fats and oils. The food frequency score obtained for fish, vegetables, pulses, roots and tubers, and fruits were found to be 81.43 per cent, 77.14 per cent, 65.83 per cent, 61 per cent and 58.57 per cent respectively. In the case of milk and milk products, egg and meat, the frequency score varied from 33.56 per cent to 46.67 per cent with the lowest score for milk and milk products.

Table 16. Frequency score (%) of different food items

Food items	Frequency score †
Cereals	100
Pulses	65.83
Leafy vegetables	59.85
Roots and tubers	61
Vegetables	77.14
Fruits	58.57
Milk and milk products	33.56
Fish	81.43
Meat	46.67
Egg	40.72
Fats and oils	100

† Based on the formula suggested by Reaburn *et al.* (1979)

Based on the percentage frequency scores obtained for different food items, the foods were classified into three groups namely most frequently used (percentage score above 75 per cent), medium frequently used (percentage score in between 50 to 75 per cent) and less frequently used (percentage score below 50 per cent) food stuffs. The results are furnished in Table 17.

Table 17. Details of frequency of use of different food items

Frequency of use	Food items
Most frequently used (Scores above 75%)	Cereals, vegetables, fish and fats and oils
Medium frequently used (scores in between 50 -75%)	Pulses, leafy vegetables, roots and tubers, and fruits
Less frequently used (Scores below 50%)	Milk and milk products, meat and egg

The results indicated that cereals, vegetables, fats and oils and fish were the most frequently used food items while pulses, leafy vegetables, roots and tubers and fruits were the moderately used food items. Milk and milk products, meat and egg were used to a lesser extent by the households.

4.2.4. Food expenditure pattern

From Table 18, it is seen that majority of the households spent up to 10 per cent of their total food expenditure for the purchase of pulses (77.86%), vegetables (43.57%), fats and oils (93.58%), milk (55%), fruits (77.15%), meat (79.29%) and egg (80%). For the purchase of cereals, 42.14 per cent of the households spent 30 to 55 per cent of monthly expenses incurred for food. About 27.86 per cent, 10 per cent and 20 percent of the households did not spend any money for the purchase of milk, fruits, meat, fish and egg respectively.

4.2.5. Preservation and storage of foods

None of the households purchased preserved food items from the shops. However, pickling was the most common preservation method used by the households. Most common storage method adopted was found to be drying and storing in tight containers.

Table 18. Monthly food expenditure pattern of the households (Percent of monthly income spent on foods)

Food items	Nil	<5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	Total
Cereals	-	10 (7.14)	6 (4.29)	7 (5)	12 (8.57)	22 (15.72)	24 (17.14)	29 (20.71)	4 (2.86)	14 (10)	8 (5.71)	4 (2.86)	140 (100)
Pulses	-	12 (8.57)	97 (69.29)	25 (17.86)	-	3 (2.14)	1 (0.71)	2 (1.43)	-	-	-	-	140 (100)
Vegetables	-	1 (0.71)	60 (42.86)	59 (42.14)	20 (14.29)	-	-	-	-	-	-	-	140 (100)
Fats and Oils	-	21 (15)	110 (78.58)	8 (5.71)	1 (0.71)	-	-	-	-	-	-	-	140 (100)
Milk	39 (27.86)	64 (45.71)	13 (9.29)	10 (7.14)	6 (4.29)	8 (5.71)	-	-	-	-	-	-	140 (100)
Fruits	14 (10)	62 (44.29)	46 (32.86)	10 (7.14)	8 (5.71)	-	-	-	-	-	-	-	140 (100)
Meat	28 (20)	101 (72.15)	10 (7.14)	-	1 (0.71)	-	-	-	-	-	-	-	140 (100)
Fish	29 (20.71)	35 (25)	25 (17.86)	49 (35)	2 (1.43)	-	-	-	-	-	-	-	140 (100)
Egg	28 (20)	98 (70)	14 (10)	-	-	-	-	-	-	-	-	-	140 (100)

(Figures in parentheses are percentage)

4.2.6. Food purchase of the households

Mean quantity of different food items purchased by the households in comparison with the mean requirement is given in Table 19. From the table it is clear that the mean quantity of cereals, pulses, vegetables, roots and tubers, fruits, milk and milk products, flesh foods, fats and oils   purchased by the family per day is significantly lower than the mean quantity required for the households as per the RDA suggested by ICMR (2010). For cereals, pulses and flesh foods 64 to 79 per cent of RDA was met by the households.

Details pertaining to the frequency of purchase of food stuffs are given in Table 20. From the table it was seen that 54.29 per cent of the households purchased vegetables daily and 67.86 per cent purchased flesh foods mainly fish thrice in a week. Majority of the households purchased cereals (73.57%), fats and oils (69.29%) once in a week.

Table 19. Mean quantity of foods purchased by the households in comparison with the mean requirement

Food items	Mean(g) ±SE	Mean requirement of the households (g)	Percentage of requirement met	t value
Cereals	1384± 68.63	1893	73	7.41**
Pulses	79± 3.63	100	79	5.83**
Vegetables	99± 4.7	207	48	22.73**
Roots and tubers	46± 11.96	160	29	9.54**
Fruits	38± 3.74	156	24	31.38**
Milk and milk products	15± 4.73	807	2	167.43**
Flesh foods	103± 5.13	160	64	11.16**
Fats and Oils	24± 2.49	165	15	56.85**

Table 20. Frequency of purchase of food item

Food items	Daily	W_3	W_2	W_1	Monthly	Occasionally	Never	Total
Cereals	-	7 (5)	30 (21.43)	103 (73.57)	-	-	-	**140 (100)**
Pulses	-	7 (5)	49 (35)	62 (44.29)	22 (15.71)	-	-	**140 (100)**
Fats and Oils	-	-	21 (15)	97 (69.29)	22 (15.71)	-	-	**140 (100)**
Vegetables	76 (54.29)	20 (14.29)	36 (25.71)	8 (5.71)	-	-	-	**140 (100)**
Roots and tubers	-	-	62 (44.28)	46 (32.86)	32 (22.86)	-	-	**140 (100)**
Flesh foods	11 (7.86)	95 (67.86)	7 (5)	27 (19.28)	-	-	-	**140 (100)**
Fruits	-	4 (2.86)	11 (7.86)	88 (62.86)	27 (19.28)	10 (7.14)	-	**140 (100)**

(Figures in the parentheses are percentage) W_3 – Weekly thrice. W_2 – Weekly twice. W_1 – Weekly once

4.3. Food adequacy of the households

Food adequacy of the households was ascertained by conducting three day recall method of diet survey among the selected 140 households. Mean food intake per consumption unit and per capita mean nutrient intake of the selected households were computed and compared with the RDA suggested by ICMR (2010) to find out the food adequacy. The details are presented in Tables 21 and 22 respectively.

4.3.1. Mean food intake per consumption unit

From Table 21, it was observed that, the intake of different food items except fats and oils and flesh foods was significantly lower than the RDA suggested by ICMR (2010). The intake of flesh foods was found to be significantly higher than the suggested allowances. In the case of cereals, 85.24 per cent of the RDA was met by the households. The intake of vegetables, leafy vegetables, roots and tubers, fruits and milk and milk products and fruits was found to be below 15 per cent of RDA. The percentage of RDA met for different food items are represented in Fig. 1.

Table 21. Mean food intake of the family members per consumption unit in comparison with the RDA

Sl.No	Foods	RDA (g)	Mean±S.E	Per cent of RDA	t value
1	Cereals	450	383.56±9.94	85.24	6.68**
2	Pulses	60	21.04±3.77	35.07	14.27**
3	Vegetables	200	25.53±3.37	12.77	65**
4	Leafy vegetables	100	2.81±1.45	2.81	99.93**
5	Roots and tubers	200	27.56±14.72	13.78	24**
6	Fruits	100	14.28±1.45	14.28	45.91**
7	Milk and milk products	300	6.21±10.65	2.07	155.58**
8	Flesh foods	30	48.59±5.02	161.96	4.05**
9	Fats and oils	30	28.1±2.35	93.67	0.84ns

** Significant at 1 % level

4.3.2. Per capita nutrient intake

The nutritive value of the diet consumed by the family members when compared with the RDA, it was seen that the intake of all nutrients was significantly lower than the RDA suggested for an adult man engaged in moderate activity (Table 22). More than 75 per cent of the RDA for protein and niacin was met in the daily diet, while the intake of fat, energy, thiamine and iron varied from 61 to 68 per cent of the RDA. The percentage of RDA met for rest of the nutrients namely retinol, riboflavin, vitamin C and calcium was found to be 27.33 per cent, 26.88 per cent, 33.05 per cent and 27.53 per cent of the RDA respectively. The percentage of RDA met for different nutrients is given in Fig. 2.

Table 22. Per capita nutrient intake of family members in comparison with the RDA

Sl.No	Nutrients	RDA	Mean±S.E	Per cent of RDA	t value
1	Protein (g)	60	44.76±1.56	74.60	9.78**
2	Fat (g)	30	18.32±1.32	61.1	9.49**
3	Energy (kcal)	2730	1694±49.38	62.05	23.88**
4	Retinol (µg)	600	164±30.48	27.33	14.31**
5	Thiamin (mg)	1.4	0.96±0.3	68.57	14.41**
6	Riboflavin (mg)	1.6	0.43±0.3	26.88	38.97**
7	Niacin (mg)	18	15.93±1.18	88.5	4.55**
8	Vitamin C (mg)	40	13.22±1.18	33.05	22.7**
9	Calcium (mg)	600	165.18±8.79	27.53	49.52**
10	Iron (mg)	17	11.24±1.16	66.12	4.98**

** Significant at 1 % level

4.4. Nutritional status of family members

The nutritional status of children, adolescents, adult and elderly of the selected households were assessed using different anthropometric measurements, dietary survey, clinical examination and biochemical examination of blood for haemoglobin. The results are furnished in this section.
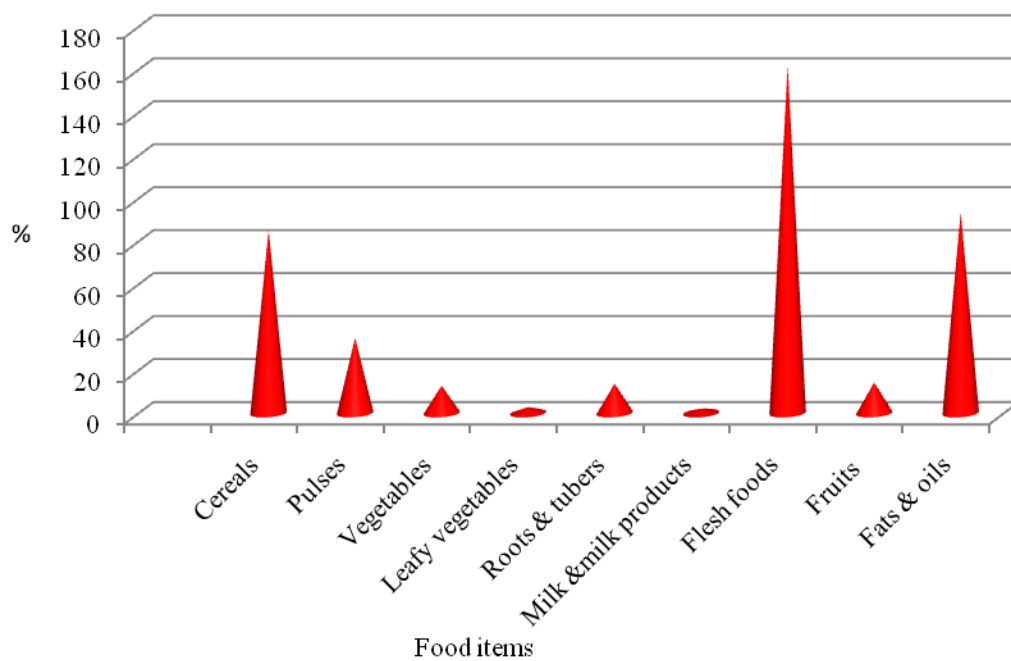
Fig. 1. Per capita food intake of family members as percentage of RDA
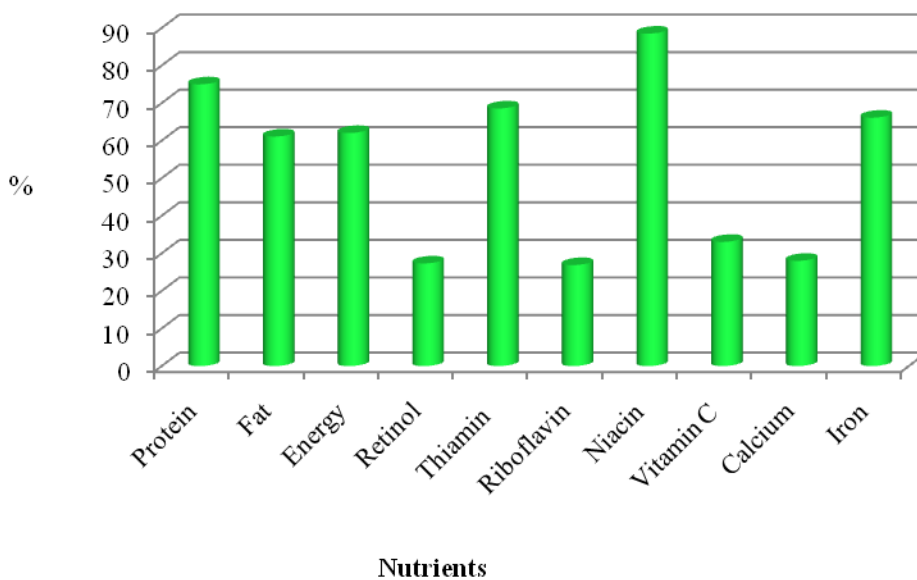
Fig. 2. Per capita nutrient intake of family members as percentage of RDA

4.4.1. Anthropometric measurements

4.4.1.1. Anthropometric measurements of children (0 to 5 years)

The nutritional status of children in the age group of 0 to 5 years was determined by measuring body weight, height, mid upper arm circumference, head circumference and chest circumference. Each measurement was compared with the reference standards suggested for respective age groups for boys and girls separately and the results are furnished below.

4.4.1.1.1. Weight

The mean weight of boys and girls aged less than five years was found to be lower than the standard weight suggested by World Health Organisation (2006) except for girls aged less than one year (Table 23). In the case of boys, the decrease was found to be statistically significant only in the age group of 1 to 3 years. In the case of girls, the decrease in the weight from the standard was found to be statistically significant in both the age group of 1 to 3 years and 3 to 5 years. The increase observed in the weight of girls below one year from the standard was found to be statistically insignificant.

To interpret the nutritional status of children below five years on the basis of weight for age classification, the percentage of weight calculated on the basis of the reference standard suggested for Indian children by WHO (2006) were categorised on the basis of the classification suggested by Gomez *et al.* (1956). The results (Table 24) indicated that 50 per cent of the boys and 33.33 per cent of the girls below five years of age were having normal nutritional status and the rest fell under different grades of malnutrition.

It was seen that about 33.33 per cent boys and 45.46 per cent girls were having grade I malnutrition and 12.5 per cent boys and 21.21 per cent girls were having grade II malnutrition. None of the girls were having grade III malnutrition while 4.17 per cent boys had grade III malnutrition. Altogether 59.65 per cent of children below five years had different degrees of malnutrition on the basis of weight for age (Fig.3).

Table 23. Comparison of the mean weight of children (0 to 5 years) with the standard

Age (years)	Boys				Girls			
	N	Mean ±SE (kg)	Standard (kg)	t value	N	Mean ±SE (kg)	Standard (kg)	t value
< 1	2	5.75 ±1.25	7.22	1.12^{NS}	6	8.83 ±1.58	6.65	1.38^{Ns}
1-3	8	10.75 ±0.25	12.06	5.24**	11	10.19 ±0.29	11.44	4.25**
3-5	14	15.44 ±0.65	16.3	1.33ns	16	13.83 ±0.79	16.08	2.86*

** Significant at 1 % level   * Significant at 5 % level   NS- non significant

Table 24. Distribution of children (0 to 5 years) on the basis of weight for age classification

Per cent of standard	Specification	Boys		Girls		Total	
		No.	Per cent	No.	Per cent	No.	Per cent
≤60	Grade III malnutrition	1	4.17	0	0	1	1.76
61-75	Grade II malnutrition	3	12.5	7	21.21	10	17.54
76-90	Grade I malnutrition	8	33.33	15	45.46	23	40.35
> 90	Normal	12	50	11	33.33	23	40.35
Total		**24**	**100**	**33**	**100**	**57**	**100**

4.4.1.1.2. Height

The mean height of boys and girls below five years was compared with the standard height suggested by WHO (2006) for different age groups and the results are given in Table 25. The mean height of boys and girls were found to be lower than the standard height suggested except girls below one year. However, the decrease was found to be statistically significant only among boys aged less than one year and girls in the age group of three to five years. In the case of girls below one year of age the increase observed in the mean height from the standard height was also found to be statistically significant.

Distribution of children on the basis of height for age classification suggested by Waterlow (1972) revealed that 50 per cent of boys and 45.46 per cent of girls below five years of age had normal nutritional status with height above 95 per cent of

the standard height suggested for the particular age group. Rest of the children had different grades of malnutrition (Table 26).

Table 25. Comparison of the mean height of children (0 to 5 years) with the standard

Age (years)	Boys				Girls			
	N	Mean ±SE (cm)	Standard (cm)	t value	N	Mean ±SE (cm)	Standard (cm)	t value
< 1	2	63.5 ±0.5	65.12	3.24**	6	80.50±5.95	63.49	2.86*
1-3	8	86.00 ±3.13	86.76	0.24ns	11	81.64±2.98	85.38	1.26ns
3-5	14	98.06 ±2.98	103.20	1.72ns	16	97.4 ±1.79	102.48	2.82*

** Significant at 1 % level   * Significant at 5 % level   NS- non significant

Among boys and girls below five years 29.17 per cent boys and 24.24 per cent girls were graded as having marginal malnutrition on the basis of height for age classification. Nearly 4.17 per cent boys and 12.12 per cent girls were having heights below 85 per cent of the standard and were found to be suffering from severe malnutrition and the rest of the boys (16.66%) and girls (18.18%) were having moderate malnutrition (Fig.4). On the basis of height for age only 47.37 per cent of children below five years had normal nutritional status.

Table 26. Distribution of children (0 to 5 years) on the basis of height for age classification

Per cent of standard	Specification	Boys		Girls		Total	
		No.	Per cent	No.	Per cent	No.	Per cent
<85	Severe malnutrition	1	4.17	4	12.12	5	8.77
85-90	Moderate malnutrition	4	16.66	6	18.18	10	17.54
90-95	Marginal malnutrition	7	29.17	8	24.24	15	26.32
> 95	Normal	12	50	15	45.46	27	47.37
Total		**24**	**100**	**33**	**100**	**57**	**100**
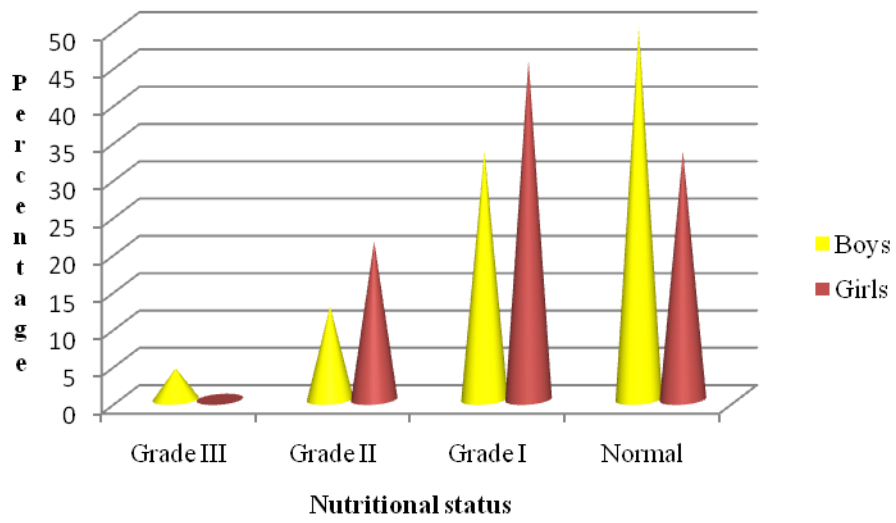
Fig. 3. Nutritional status of children (0 to 5 years) on the basis of weight for age
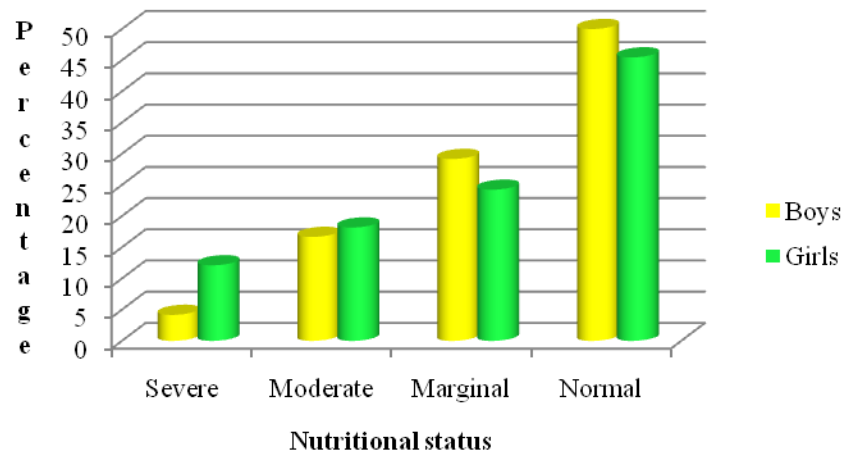
Fig. 4. Nutritional status of children (0 to 5 years) on the basis of height for age

4.4.1.1.3. Weight / Height ^{2} (wt/ht^2)

On the basis of wt/ht^2 classification also, 50 per cent boys and 54.55 per cent girls were graded as having normal nutritional status (Table 27 & Fig.5). It was also seen that 29.17 per cent boys and 24.24 per cent girls were having moderate malnutrition and the rest of the boys (20.83%) and girls (21.21%) were found to be undernourished on the basis of wt/ht^{2}classification. On this basis a total of 47.37 per cent children less than five years had either under nutrition or moderate malnutrition.

Table 27. Distribution of children (0 to 5 years) on the basis of weight /height^2 classification

Weight/height^2	Specification	Boys		Girls		Total	
		No.	Per cent	No.	Per cent	No.	Per cent
< 0.0013	Undernourished	5	20.83	7	21.21	12	21.05
0.0013 – 0.0015	Moderate malnutrition	7	29.17	8	24.24	15	26.32
>0.0015	Normal	12	50	18	54.55	30	52.63
Total		24	100	33	100	57	100

4.4.1.1.4. Mid Upper Arm Circumference (MUAC)

On the basis of MUAC, all children below five years were found to be having a mid upper arm circumference above the standard MUAC of 13.5 cm and were graded as having normal nutritional status. (Table 28)

Table 28. Distribution of children (0 to 5 years) on the basis of MUAC

MUAC (cm)	Specification	Boys		Girls		Total	
		No.	Per cent	No.	Per cent	No.	Per cent
<12.5	Severe malnutrition	0	0	0	0	0	0
12.5 -13.5	Moderate malnutrition	0	0	0	0	0	0
>13.5	Normal	24	100	33	100	57	100
Total		**24**	**100**	**33**	**100**	**57**	**100**

4.4.1.1.5. Head/Chest circumference ratio

When the children in the age group of six months to five years were categorised on the basis of head/chest circumference ratio, it was seen that majority of the boys (78.26%) and girls (71.88%) were graded as having normal nutritional status and only 21.74 per cent boys and 28.12 per cent girls were graded as malnourished (Table 29). Altogether 74.55 per cent children were found to be having normal nutritional status.

Table 29. Distribution of children (6m to 5 years) on the basis of Head /Chest circumference ratio

Head/chest circumference ratio	Specification	Boys		Girls		Total	
		No.	Per cent	No.	Per cent	No.	Per cent
< One	Normal	18	78.26	23	71.88	41	74.55
≥ One	Malnourished	5	21.74	9	28.12	14	25.45
Total		23	100	32	100	55	100

4.4.1.2.Anthropometric measurements of children (6 to 12 years)

4.4.1.2.1. Weight

The mean weight of children in the age group of 6 to 12 years was also compared with the standard weight suggested for respective age groups and the results are furnished in Table 30. It was seen that the mean weight of boys and girls in the age group of 6 to 8 years and 9 to 12 years were lower than the standard weight suggested except for girls in the age group of 9 to 12 years. However, the decrease was found to be statistically significant only among boys aged 9 to 12 years. In the case of girls aged 9 to 12 years, the mean weight was found to be significantly higher than the standard.

Table 30. Comparison of the mean weight of children (6 to 12 years) with the standard

Age (years)	Boys				Girls			
	N	Mean ±SE (kg)	Standard (kg)	t value	N	Mean ±SE (kg)	Standard (kg)	t value
6 -8	18	22.06 ±0.95	22.77	0.75ns	7	22.14 ±1.79	22.43	0.16ns
9-12	21	29.74±1.36	32.73	2.21*	17	39.31 ±1.65	33.15	3.74**

** Significant at 1 % level   * Significant at 5 % level   NS- non significant

Distribution of children on the basis of weight for age classification suggested by Gomez *et al.* (1956) indicated that 43.59 per cent boys and 20.84 per cent girls in the age group of 6 to 12 years had either grade I or grade II malnutrition. Nearly 56.41 per cent boys and 79.16 per cent girls had normal nutritional status on the basis of weight for age classification. The details are given in Table 31 and Fig.6. It was found that 34.92 per cent of children in the age group of six to 12 years had different degrees of malnutrition.

Table 31. Distribution of children (6 to 12 years) on the basis of weight for age classification

| Weight-for age (Per cent of the standard)	Specification	Boys		Girls		Total	
		No.	Per cent	No.	Per cent	No.	Per cent
≤60	Grade III malnutrition	0	0	0	0	0	0
61-75	Grade II malnutrition	6	15.38	1	4.17	7	11.11
76-90	Grade I malnutrition	11	28.21	4	16.67	15	23.81
> 90	Normal	22	56.41	19	79.16	41	65.08
Total		**39**	**100**	**24**	**100**	**63**	**100**
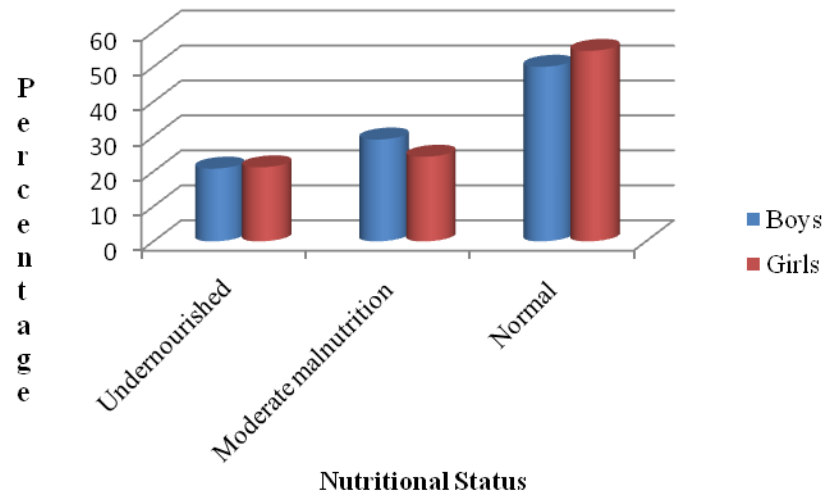
Fig. 5. Nutritional status of children (0 to 5 years) on the basis of weight /height^2
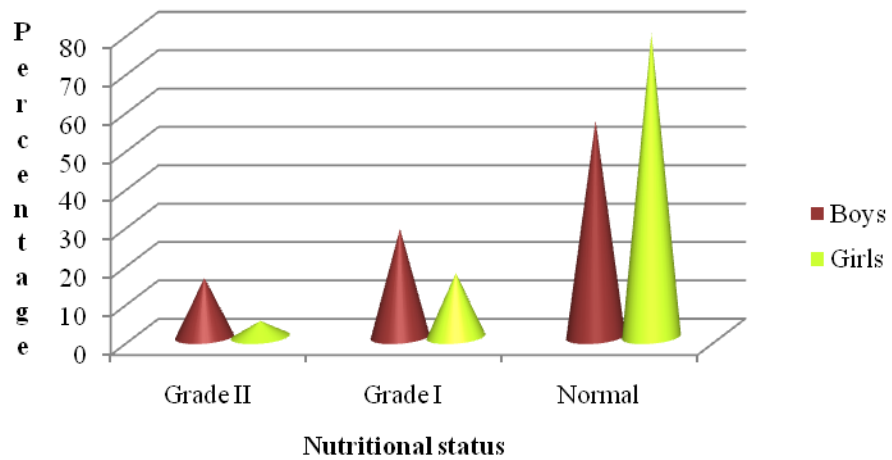
**Fig. 6. Nutritional status of children (6 to 12 years) on the basis of weight for age**

4.4.1.2.2. Height

From Table 32 it is clear that the mean height of boys in the age group of 6 to 8 years and 9 to 12 years, is lower than the standard height suggested. However, the decrease was found to be statistically significant only in the case of 9 to 12 years. In the case of girls aged 6 to 8 years and 9 to 12 years, the mean height was found to be higher than the standard height suggested for the respective age groups. However, the increase was found to be statistically insignificant in both age groups.

Table 32. Comparison of the mean height of children (6 to 12 years) with the standard

Age (years)	Boys				Girls			
	N	Mean ±SE (cm)	Standard (cm)	t value	N	Mean ±SE (cm)	Standard (cm)	t value
6-8	18	122.5 ±2.24	124.3	0.8ns	7	139.57 ±8.9	123	1.81ns
9-12	23	136.26 ±2.46	142.63	2.59*	16	143.88 ±2.65	142	0.47ns

* Significant at 5 % level   NS- non significant

To interpret the nutritional status on the basis of height for age, the percentage of height calculated on the basis of the reference standard was categorised into different groups on the basis of the classification suggested by Waterlow (1972). The results are given in Table 33. It was seen that about 10.26 per cent boys and 4.17 per cent girls had severe malnutrition on the basis of height for age classification. Nearly 69.23 per cent boys and 75 per cent girls were found to be having normal nutritional status. Rest of the boys (20.51%) suffered from moderate or marginal malnutrition. Nearly 20.83 per cent girls also had marginal malnutrition. Nutrional status of children on the basis of height for age is depicted in Fig.7. On the basis of height for age data it was seen that 28.57 per cent children in the age group of six to 12 years suffered from malnutrition

Table 33. Distribution of children (6 to 12 years) on the basis of height

for age classification

Per cent of the standard	Specification	Boys		Girls		Total	
		No.	Per cent	No.	Per cent	No.	Per cent
<85	Severe malnutrition	4	10.26	1	4.17	5	7.93
85-90	Moderate malnutrition	1	2.56	0	0	1	1.59
90-95	Marginal malnutrition	7	17.95	5	20.83	12	19.05
> 95	Normal	27	69.23	18	75	45	71.43
Total		**39**	**100**	**24**	**100**	**63**	**100**

4.4.1.3. Anthropometric measurements of adolescents (13 -17 years)

4.4.1.3.1. Weight

In the case of adolescents, the mean weight of boys was found to be lower than the standard weight suggested for different age groups. However, the decrease was found to be statistically significant only in the case of adolescent boys in the age group of 15 to 17 years. The details are given in Table.34. In the case of girls, the mean weight was found to be higher than the standard only in the age group of 13 to 15 years. The increase was found to be statistically insignificant.

Table 34. Comparison of the mean weight of adolescents with the standard

Age group (years)	Boys				Girls			
	N	Mean ±S.E (kg)	Standard (kg)	t value	N	Mean ±SE (kg)	Standard (kg)	t value
13-15	14	44.45±2.76	47.6	1.28ns	9	48.71±1.73	46.63	0.93ns
15-17	18	46.25±3.75	54.1	2.15**	11	50.44±2.08	51.17	0.41ns

** Significant at 1 % level   NS- non significant

4.4.1.3.2. Height

In the case of height, the mean height was found to be lower than the standard in the case of both boys and girls when compared to the standard height. However, the decrease was significant only in the case of boys aged 13 to 15 years and 15 to 17 years. The details are given in Table 35.

Table 35. Comparison of the mean height of adolescents with the standard

Age group (years)	Boys				Girls			
	N	Mean ±S.E (cm)	Standard (cm)	t value	N	Mean ±S.E (cm)	Standard (cm)	t value
13-15	14	153.7±1.55	162.1	5.42**	9	154±2.6	156.53	0.97ns
15-17	18	155.17±1.85	168.2	7.04**	11	157.78±1.05	159.57	1.7ns

** Significant at 1 % level   NS- non significant

4.4.1.3.3. Body Mass Index

To find out the nutritional status of adolescents, Body Mass Index was computed from the weight and height measurements using the formula $wt(kg)/ht^2(m)$. Then, the adolescent boys and girls were grouped in to different categories on the basis of Body Mass Index as suggested by James *et al* (1988) and Luizz *et al* (1992). The results are given in Table 36.

The results indicated that about 53.13 per cent of boys had normal nutritional status with a Body Mass Index in the range of 20-25 kg /m^2. About 34.37 per cent of boys were categorized as undernourished. In the case of girls, 65 per cent had normal nutritional status and 25 per cent were found to be under nourished. Only 5 per cent girls were having Grade I obesity (Fig.8). On the basis of BMI, 57.69 per cent adolescents were found to be having normal nutritional status
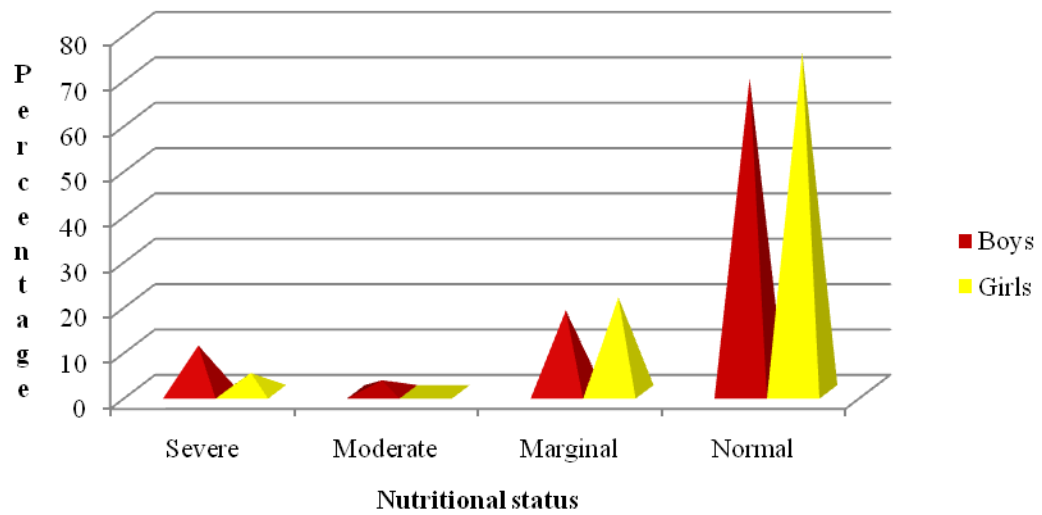
Fig. 7. Nutritional status of children (6 to 12 years) on the basis of height for age
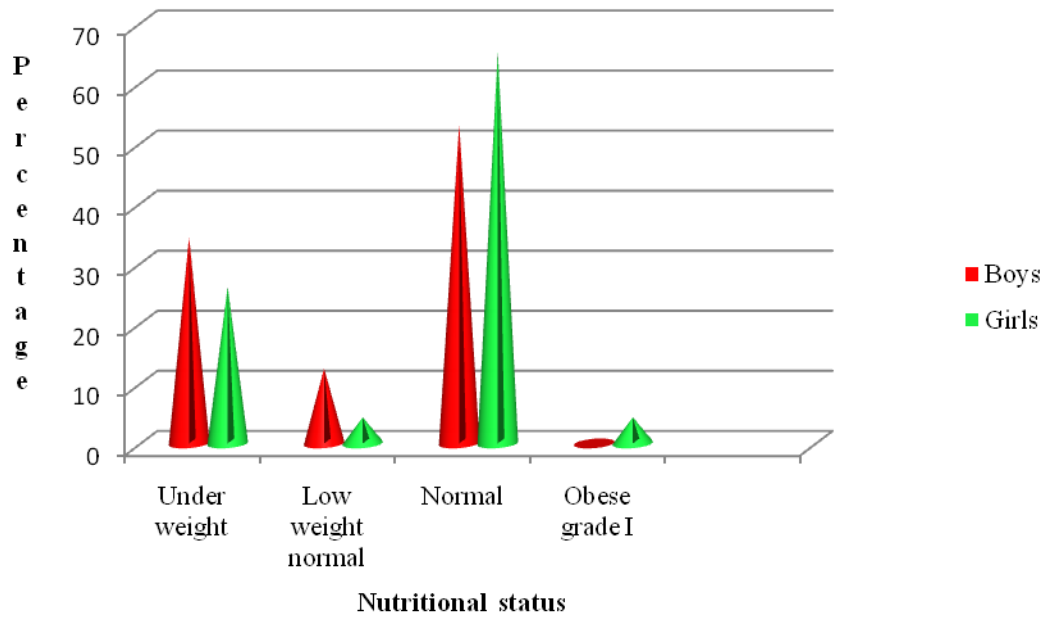
Fig. 8. Nutritional status of adolescents on the basis of BMI

Table 36. Classification of adolescents on the basis of BMI

BMI (kg/m²)	Nutritional status	Boys		Girls		Total	
		No.	Per cent	No.	Per cent	No.	Per cent
<18.5	Under nourished	11	34.37	5	25	16	30.77
18.5-20	Low weight normal	4	12.50	1	5	5	9.62
20-25	Normal	17	53.13	13	65	30	57.69
25-30	Obese grade I	0	0	1	5	1	1.92
>30	Obese grade II	0	0	0	0	0	0
Total		**32**	**100**	**20**	**100**	**52**	**100**

4.4.1.4. Anthropometric measurements of adults

4.4.1.4.1. Weight

In the case of adults, the mean weight of men and women was found to be significantly lower than the standard weight suggested for different age groups except for men in the age group of 18 to 19 years. The mean weight of men in the age group of 18 to 19 years was found to be significantly higher than the standard. The details are given in Table.37.

Table 37. Comparison of the mean weight of adults with the standard

Age group (years)	Men				Women			
	N	Mean ±S.E (kg)	Standard (kg)	t value	N	Mean ±SE (kg)	Standard (kg)	t value
18-19	9	59.33±1.12	58.4	0.84**	4	51 ±0.41	53.8	6.86**
20-29	36	57.4 ±0.9	61.25	4.27**	54	51.71 ±1.24	55.45	3.02**
30-39	46	58.65 ±0.95	64.35	6.02**	55	53.47 ±0.74	59.15	7.66**
40-49	50	58.6 5±1.12	66.1	6.67**	50	55.14 ±1.01	61.55	6.32**
50-59	27	58.85 ±1.28	66.15	5.72**	32	50.19 ±1.29	60.35	7.86**
60-64	14	55.67 ±1.75	64.1	4.82**	14	52 ±1.68	60	7.21**

** Significant at 1 % level

4.4.1.4.2. Height

In the case of height, the mean height of men and women was found to be significantly lower than the standard height suggested by NNMB (2002) for different age groups. The details are given in Table 38.

Table 38. Comparison of the mean height of adults with the standard

Age group (years)	Men				Women			
	N	Mean ±S.E (cm)	Standard (cm)	t value	N	Mean ±SE (cm)	Standard (cm)	t value
18-19	9	162.22±1.7	171.3	5.35**	4	156±2.68	161.1	1.91ns
20-29	36	162.13±0.83	172.4	12.38**	54	155.18±0.7	160.85	8.15**
30-39	46	161.59±0.8	172.3	13.43**	55	154.87±0.65	160.75	9.09**
40-49	50	162.94±0.94	172.2	9.81**	50	155.2 ±0.64	160.45	8.12**
50-59	27	161.48±0.94	171.6	10.8**	32	153.47±0.94	159.9	6.81**
60-64	14	161±1.26	171.4	8.27**	14	155.21±1.26	159.2	3.17**

4.4.1.4.3. Body Mass Index

To find out the nutritional status of adult men and women in the age group of 18 to 64 years, Body Mass Index (BMI) was computed from the weight and height measurements using the formula $wt(kg)/ht^2(m)$. Based on BMI, men and women were grouped in to different categories as suggested by James *et al* (1988) and Luizz *et al* (1992). The results are given in Table 39 and Fig.9.

The results indicated that about 73.62 per cent men and 69.85 per cent women were having normal nutritional status with a Body Mass Index in between 20-25 kg /m^2. Ten to 11 per cent men and women were having Grade I obesity. Only 4.40 per cent men and 7.66 per cent women were categorized as under nourished. Among the total population in the age group of 18-64 years also 71.61 per cent were found to be having normal nutritional status and 11.51 per cent had low weight with normal nutritional status. Only one woman (0.25 %) was found to be having grade II obesity.

Table 39. Classification of adults on the basis of BMI

BMI (kg/m²)	Nutritional status	Men		Women		Total	
		No	Per cent	No	Per cent	No	Per cent
<18.5	Under nourished	8	4.40	16	7.66	24	6.14
18.5-20	Low weight normal	20	10.99	25	11.96	45	11.51
20-25	Normal	134	73.62	146	69.85	280	71.61
25-30	Obese Grade I	20	10.99	21	10.05	41	10.49
>30	Obese Grade II	0	0	1	0.48	1	0.25
Total		182	100	209	100	391	100

4.4.1.5. Anthropometric measurements of elderly

4.4.1.5.1. Weight

The mean weight of elderly men and women was found to be lower than the standard weight suggested by NNMB (2002). The details are given in Table 40. In the case of men, the decrease was found to be statistically significant only among the elderly aged above 80 years. In the case of women, the decrease in the weight from the standard was found to be statistically significant only in the age group of 75 to 80 years.

Table 40. Comparison of the mean weight of elderly with the standard

Age (years)	Men					Women				
	N	Mean ±SE (kg)	Standard (kg)	Percent of standard	t value	N	Mean ±S.E (kg)	Standard (kg)	Per cent of standard	t value
65-70	2	59 ±1.98	63.4	93	-	3	55.67 ±5.69	59.4	94	0.66ns
70-75	6	58.33 ±3.07	62.8	93	1.46ns	11	57.3 ±2.64	57.8	99	0.186ns
75-80	2	62.22 ±2.27	64.4	97	0.96ns	6	50.33 ±2.09	56.2	90	2.8*
>80	7	56 ±1.73	61.55	91	3.2**	12	53.14 ±1.25	55.55	96	1.92ns

** Significant at 1 % level   * Significant at 5 % level   NS- non significant

4.4.1.5.2. Height

The mean height of elderly men and women was compared with the standard height suggested by NNMB (2002) for the respective age groups and the results are given in Table 41. The mean height of elderly men and women were found to be lower than the standard height suggested. However, the decrease was found to be statistically significant only among men in the age group of 70 to 80 years and above 80 years.

Table 41. Comparison of the mean height of elderly with the standard

Age (years)	Men					Women				
	N	Mean ±S.E (kg)	Standard (kg)	Per cent of standard	t value	N	Mean ±S.E (kg)	Standard (kg)	Per cent of standard	t value
65-70	2	162 ±1.65	171	95	1.2ns	3	157.33±1.86	159.2	99	1.0ns
70-75	6	159.83 ±1.83	171.4	93	6.3**	11	158.15±1.48	159.2	99	0.7ns
75-80	2	161 ±0.66	170.3	95	13.95**	6	158±0.58	158.9	99	1.56ns
>80	7	157 ±1.49	170.2	92	8.85**	12	157.57±0.68	157.8	99.72	0.34ns

** Significant at 1 % level   NS- Non significant

4.4.1.5.3. Body Mass Index

On the basis of Body Mass Index, 64.71 per cent elderly men and 46.88 per cent elderly women had normal nutritional status (Table 42 & Fig.10). Nearly 11.76 per cent men and 31.25 per cent women were found to be undernourished. Among the total elderly 53.06 per cent were found to be having normal BMI and 4.08 per cent had grade I obesity.
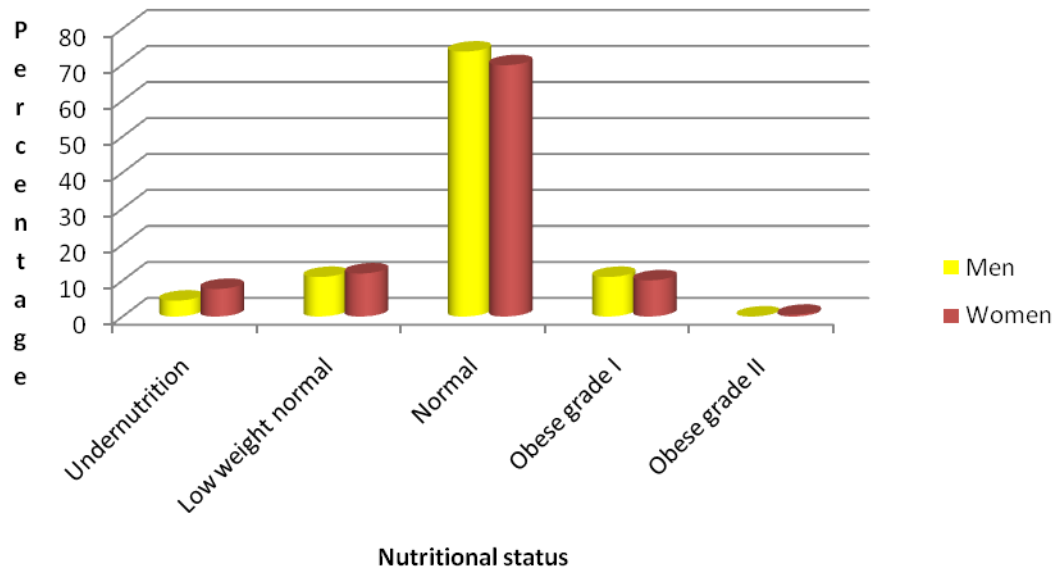
Fig. 9. Nutritional status of adults on the basis of BMI
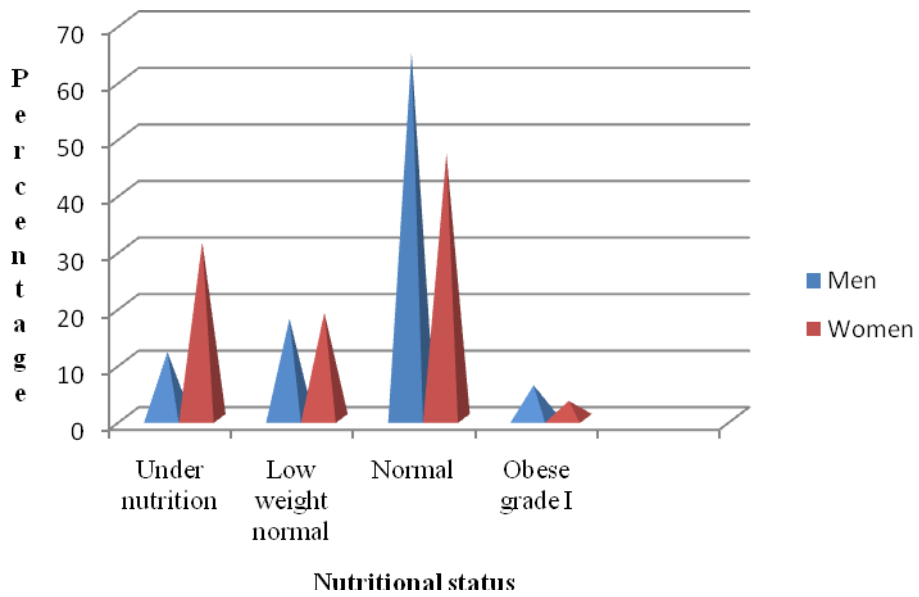
Fig. 10. Nutritional status of elderly on the basis of BMI

Table. 42. Classification of elderly on the basis of BMI

BMI (kg/m^2)	Nutrional status	Men		Women		Total	
		No	Per cent	No	Per cent	No	Per cent
<18.5	Under nourished	2	11.76	10	31.25	12	24.49
18.5-20	Low weight normal	3	17.65	6	18.75	9	18.37
20-25	Normal	11	64.71	15	46.88	26	53.06
25-30	Obese Grade I	1	5.88	1	3.12	2	4.08
>30	Obese Grade II	0	0	0	0	0	0
Total		17	100	32	100	49	100

4.4.2. Actual food and nutrient intake of women and preschool children

To obtain precise data on actual food and nutrient intake and to assess the quantity and quality of the foods consumed by women and preschool children one day food weighment survey was conducted among a sub sample of 28 women and 28 preschool children. The quantity of each food item was compared with the quantity specified for a balanced diet suggested by ICMR (2010) for women engaged in moderate activity and preschool children in the age group of 4 to 6 years. The quantity recommended for one portion was multiplied by the number of portions so as to arrive the RDA. This quantity was taken as the amount required for a balanced diet for women and preschool children.

The nutrients computed from the foods consumed by women and preschool children were also compared with the RDA suggested by ICMR (2010) for women engaged in moderate activity and preschool children in the age group of 4 to 6 years. Both the food and nutrient intake of women and preschool children were statistically analysed and the percentage of RDA of food and nutrients met by them were computed. The details are furnished in this section.

4.4.2.1. Actual food and nutrient intake of women

The details pertaining to the actual food and nutrient intake of women are given in Table 43 and 44 respectively.

From Table 43, it was observed that, the intake of all food groups except fats and oils and flesh foods was lower than the RDA suggested by ICMR (2010) for women engaged in moderate activity. Among these, the intake of fats and oils was found to be significantly higher than the RDA. In the case of all other food groups, the intake was found to be significantly lower than the suggested RDA. It was seen that only 3 to 20 per cent of the RDA of vegetables, roots and tubers, fruits and milk and milk products was met by women.

Table 43. Mean food intake of women in comparison with the RDA

Food items	Women			
	RDA	**Mean±SE**	**Percentage of RDA met**	**t value**
Cereals	330	243.29±10.08	73.755	8.6**
Pulses	45	20.48±7.2	45.61	4.63**
Vegetables	200	26.27±7.34	13.13	28.65**
Roots&tubers	200	40.67±14.63	20.34	14.75**
Leafy vegetables	100	0	0	-
Fruits	100	17.86±7.44	17.86	11.04**
Milk& milk products	300	10±4.29	3.33	68.16**
Flesh foods	30	39.44±11.01	131.47	0.76ns
Fats and Oils	25	46.32±5.78	185.28	4.08**

** Significant at 1 % level   NS- Non significant

Table 44. Mean nutrient intake of women in comparison with the RDA

Nutrient	Women			
	RDA	Mean ± SE	Percentage of RDA met	t value
Energy(k cal)	2230	1316.21±69.11	59.02	13.22**
Protein (g)	55	31.1±2.88	56.55	8.29**
Fat (g)	25	30.69±4.97	122.76	1.15ns
Calcium (mg)	600	116.2±10.86	19.37	44.55**
Iron (mg)	21	7.99±1.77	38.05	7.34**
Retinol (µg)	600	102.35±19.36	17.06	25.7*8
Thiamine (mg)	1.1	0.74±.3	67.27	0.3ns
Riboflavin (mg)	1.3	.4±.08	30.77	10.87**
Niacin (mg)	14	12.15±0.63	86.79	2.95**
Vitamin C (mg)	40	17.65±4.14	44.13	5.39**

** Significant at 1 % level   NS- Non significant

The results (Table 44) indicated that the intake of all nutrients except fat was found to be lower than the RDA. The intake of energy, protein, calcium, iron, retinol, riboflavin, niacin and vitamin C was found to be significantly lower than the RDA.

4.**4.2.2. Actual food and nutrient intake of preschool children**

From Table 45, it was observed that, the intake of cereals and flesh foods was significantly higher than the RDA suggested for preschool children. The intake of pulses, vegetables, roots and tubers, fruits and milk and milk products was significantly lower than the suggested RDA. It was also seen that only 8 to 28 per cent of the RDA of these food groups were met by the preschool children. About 71to 98 per cent of RDA of pulses, fruits, fats and oils was also met in the daily diet of preschool children. Food intake of women and preschool children as percentage of RDA is given in Fig.11.

Table 45. Mean food intake of preschool children in comparison with the RDA

Food items	Preschool children			
	RDA	Mean ±SE	Percentage of RDA met	t value
Cereals	120	139.01±5.82	115.84	3.27**
Pulses	30	11.53±5.06	38.43	7.16**
Vegetables	100	14.01±4.18	14.01	22.52**
Roots and tubers	100	16.24±4.5	16.24	21.34**
Fruits	100	11.81±6.67	11.81	52.42**
Milk and milk products	500	40.56±4.07	8.11	32.33**
Flesh foods	50	16.0±1.03	32	4.33**
Fats and Oils	25	21.08±3.09	84.32	1.0ns

Table 46. Mean nutrient intake of preschool children in comparison with the RDA

Nutrient	Preschool children			
	RDA	Mean±SE	Percentage of RDA met	t value
Energy(k cal)	1060	702.69±44.22	66.29	8**
Protein (g)	16.7	17.22±2.75	103.11	1.13ns
Fat (g)	27	12.97±2.19	48.03	6.4**
Calcium (mg)	600	58.98±6.93	9.83	78**
Iron (mg)	9	4.87±1.01	54.11	4.07**
Retinol (µg)	400	86.51±39.93	21.63	7.85**
Thiamine (mg)	0.5	0.38±1.3	76	1.11ns
Riboflavin (mg)	0.6	0.24±.04	40	8.23**
Niacin (mg)	0.8	5.97±0.31	74.63	85.12**
Vitamin C (mg)	40	9.19±2.32	22.98	13.33**
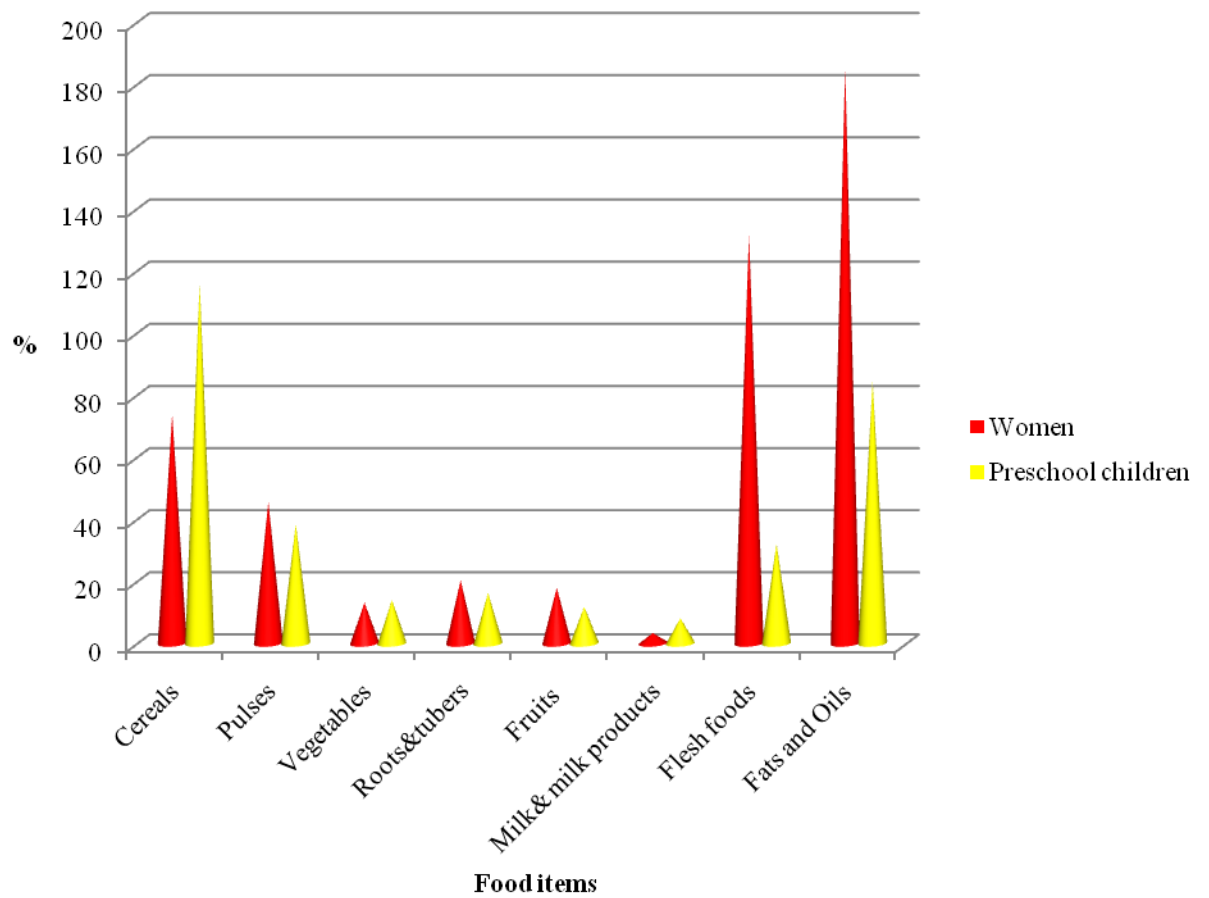
Fig. 11. Food intake of women and preschool children as percentage of RDA

In the case of nutrients, it was seen that the intake of protein and thiamine was higher than the RDA suggested for preschool children. However, the increase was found to be statistically insignificant. The intake of energy, fat, calcium, iron, retinol, riboflavin, niacin and vitamin C were found to be significantly lower than the RDA. It was also seen that only nine to 75 per cent of the RDA of these nutrients were met in the diet of preschool children. The nutrient intake of women and preschool children as percentage of RDA is given in Fig.12.

4.4.3. Clinical examination

The important clinical manifestations observed among women included xerosis of conjunctiva (21.43%), mild form of angular stomatitis (50%), gingivitis (35.71%), dental caries (85.71%), and paleness of tongue (64.29%) and face (71.43%), mottled and discoloured teeth (42.86%), loss of luster of hair (21.43%) and skin (28.57%). The appearance of 85.71 per cent women was found to be poor.

Among preschool children, the important clinical manifestations observed were pigmentation of eyes (17.86%), mild angular stomatitis (14.29%), dental caries (89.29%), mottled and discoloured teeth (28.57%), pale tongue (28.57%), loss of luster of hair (7.14%) and skin (3.57%). Other clinical manifestations like pigmentation of eyes, gingivitis, spares and brittle hair were also observed among few children.

It was also observed that majority of preschool children (71.43%) were found to be good in appearance and no clinical manifestations of nutritional deficiencies were observed among them. However, majority of women exhibited clinical manifestations of deficiency symptoms. The details are presented in Table. 47
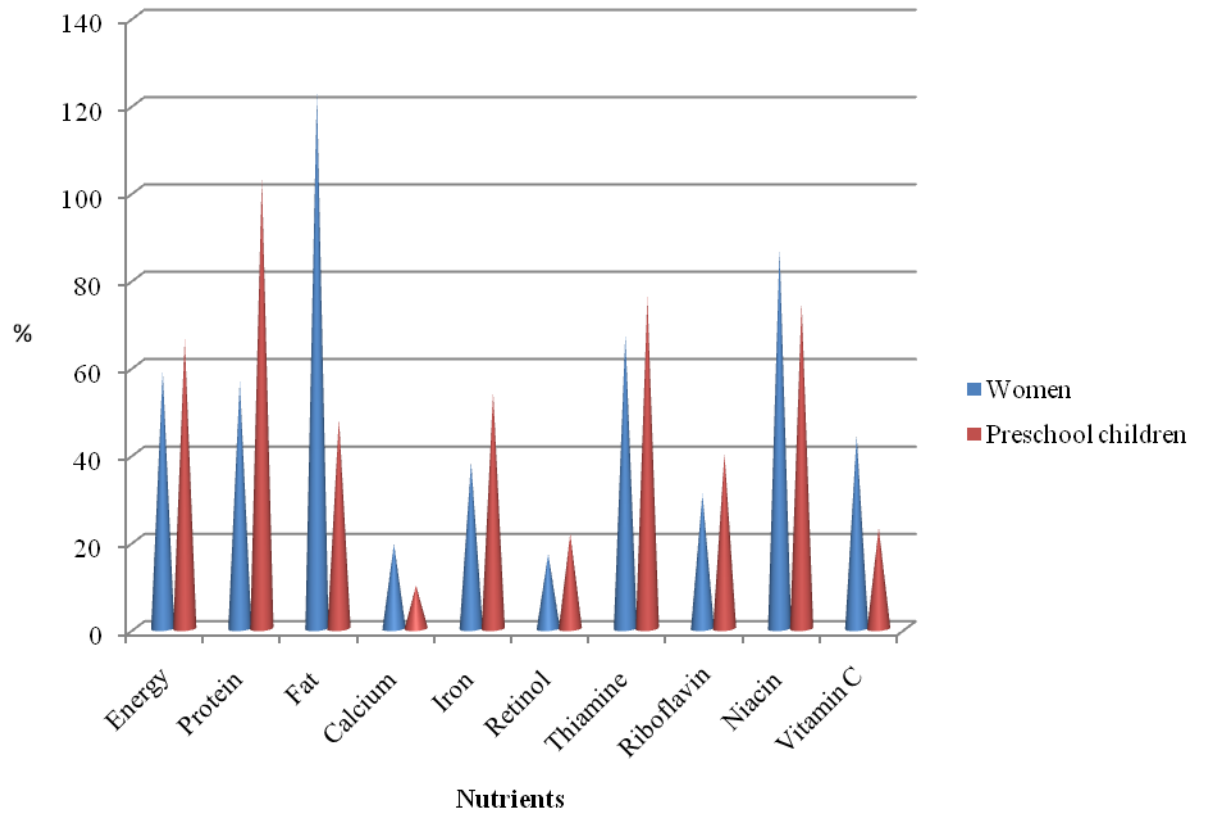
Fig. 12. Nutrient intake of women and preschool children as percentage of RDA

Table 47. Clinical manifestations observed among women and preschool children

S. No.	Clinical manifestations	No. of respondents			
		Women		Preschool children	
		No.	Per cent	No.	Per cent
1.	**General appearance**				
	Good	4	14.29	20	71.43
	Poor	24	85.71	8	28.57
	Total	28	100	28	100
2.	**Eyes**				
	Xerosis of conjunctiva	6	21.43	0	0
	Pigmentation of eyes	3	10.71	5	17.86
	Xerosis of cornea	0	0	0	0
	Night blindness	0	0	0	0
3.	**Mouth**				
	Mild Angular Stomatitis	14	50	4	14.29
	Gingivitis	10	35.71	1	3.57
	Dental caries	24	85.71	25	89.29
	Mottled and discoloured teeth	12	42.86	8	28.57
	Pale tongue	18	64.29	8	28.57
	Fissuring of tongue	2	7.14	0	0
4.	**Hair**				
	Loss of luster	16	21.43	2	7.14
	Spares and brittle hair	8	3.57	1	3.57
5.	**Skin**				
	Loss of luster	8	28.57	1	3.57
6.	**Face**				
	Pale face	20	71.43	4	14.29

4.4.4. Biochemical estimation of blood

The blood haemoglobin was estimated among women (subsample) and the haemoglobin values were compared with the standard value for adult non pregnant women suggested by WHO as given in Gopaldas and Seshadri (1987). The distribution of respondents on the basis of haemoglobin values are given in Table 48. From the table it is evident that only 10.72 per cent of women had normal haemoglobin level of more than 12g per 100ml and the rest had haemoglobin values below 12g per 100ml.

Table 48. Distribution of women on the basis of haemoglobin level.

Haemoglobin level (g/dl)	Number of women	Per cent
<10	15	53.57
10-11.9	10	35.71
>12	3	10.72
Total	**28**	**100**

To find out the severity of anaemia, the women who had haemoglobin level lower than 12g per 100 ml were categorised into different grades of anaemia as suggested by WHO (1968) and the details are given in Table 49 and Fig. 13. It was observed that 40 per cent of respondents had mild anaemia with a haemoglobin value in between 10 to 11.9g per 100ml and 52 per cent women had moderate anaemia with a haemoglobin level in the range of 7 to 10g per 100ml. Only 8 per cent of women had severe anaemia.

Table 49. Severity of anaemia among women

Grades of aneamia	Haemoglobin level (g/100ml)	Number of women	per cent
Severe	<7	2	8
Moderate	7-10	13	52
Mild	10-11.9	10	40
Total		**25**	**100**
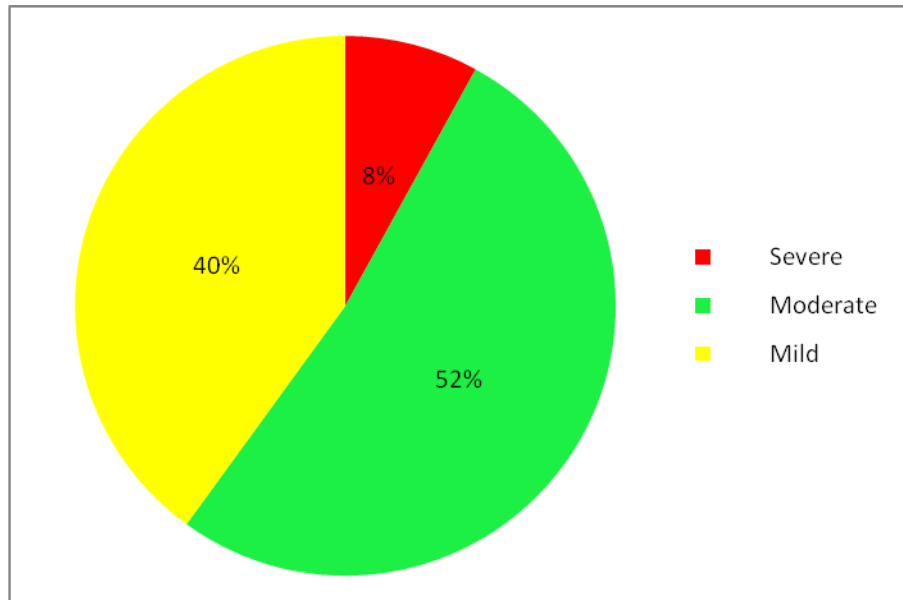
Fig. 13. Severity of anaemia among women

4.5. Food security of the households

4.5.1. Food security of the households using USDA module

To find out the type of food security, the households were grouped into different categories on the basis of the food security scale values obtained for each of the households. This grouping was done separately for households with children and without children. The food security score obtained for the households with and without children are given in Table 50. The details pertaining to the food security status of the households on the basis of the code values are given in Table 51Table 50. Distribution of households on the basis of food security raw score

| Raw score | Number of households | | Total |
	with children	without children	
0	42 (40.38)	26 (72.22)	68 (48.57)
1	0	0	0
2	0	0	0
3	0	0	0
4	6 (5.77)	0	6 (4.29)
5	2 (1.92)	0	2 (1.43)
6	8 (7.69)	0	8 (5.71)
7	6 (5.77)	2 (5.56)	8 (5.71)
8	4 (3.85)	0	4 (2.86)
9	8 (7.69)	6 (16.66)	14 (10)
10	10 (9.62)	2 (5.56)	12 (8.56)
11	6 (5.77)	-	6 (4.29)
12	6 (5.77)	-	6 (4.29)
13	4 (3.85)	-	4 (2.86)
14	0	-	0
15	0	-	0
16	2 (1.92)	-	2 (1.43)
17	0	-	0
18	0	-	0
Total	**104 (100)**	**36 (100)**	**140 (100)**

From Tables 50 & 51 it was seen that 40.38 per cent and 72.22 per cent of the households with children and without children did not indicate any problems or concerns in meeting their food needs. All these households obtained a raw score and code value of zero and were categorized as food secure. Thus, from Table 51 it is clear that altogether 48.57 per cent of the households in the study area were found to be food secure. The results also indicated that all these households obtained a raw score and code value of zero and were categorized as food secure.

Table 51. Distribution of family members on the basis of food security status

Food security status	Code value	Number of house holds		Total
		With children	Without children	
Food secure	0	42 (40.38)	26 (72.22)	68 (48.57)
Food insecure without hunger	1	22 (21.15)	0	22 (15.71)
Food insecure with moderate hunger	2	34 (32.70)	2 (5.56)	36 (25.72)
Food insecure with severe hunger	3	6 (5.77)	8 (22.22)	14 (10)
Total		104	36	140

Among the households with children 21.15 per cent reported four to seven indications of food insecurity. Among the households without children none of the households indicated three to five indications of food insecurity. The households with and without children who obtained a raw score in the range of three to seven and three to five respectively were categorized as food insecure without hunger with a code value of one (Table 51). From the table it could be seen that only 15.71 per cent of the households in the study area were food insecure without hunger.

From Table 50 it is clear that in the households with children 32.70 per cent reported 8 to 12 indications of food insecurity while in the households with children only 5.56 per cent indicated six to eight indications of food insecurity. All these households with a code value of two were categorized as food insecure with moderate hunger. Altogether in the study area 25.72 per cent of the households were found to be food insecure with moderate hunger.

Rest of the households (10%) were categorised as food insecure with severe hunger. Among this, only 5.77 per cent were found to be with children. However, food insecurity with severe hunger was found among 22.22 per cent of the households without children. All these households with and without children obtained a raw score in the range of 13 to 16 and nine to 10 respectively with a code value of three.

The results also indicated more food insecurity in the households with children. Individual scale and code values obtained for the different households were taken and the mean scale and code values are presented in Fig.14.

4.5.2. Food security of the households on the basis of access, availability and utilisation of foods

The index developed to assess the food security of the households on the basis of access, availability and utilization of foods were categorised in to different quartiles. All those households whose index is below the first quartiles ie. below 4637 were assessed as having severe food insecurity and those households who had an index above the third quartile ie. 6444 were assessed as food secure. The rest with an index in between 4637 and 6444 were classified as moderately food insecure. The results are furnished in Table 52. On the basis of this index, 51.42 per cent of the households were found to be moderately food insecure and only 24.29 per cent were found to be food secure. Severe food insecurity was also noticed among 24.29 per cent of the households.
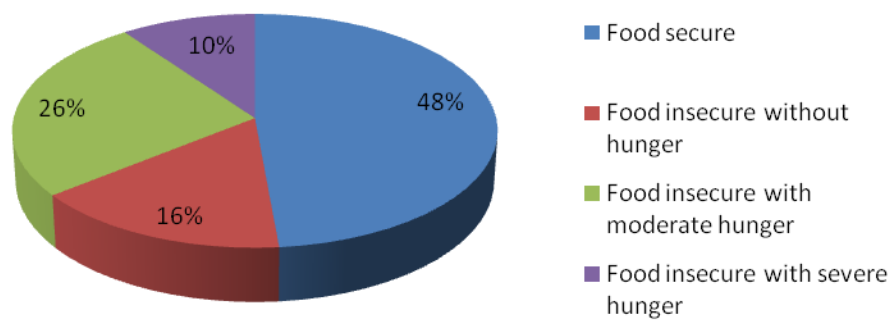
Fig. 14. Food security status of the households

Table 52. Food security of the households on the basis of access, availability and utilisation.

Food security status	No. of households	Per cent
Food secure (>6444)	34	24.29
Moderately food insecure (4637 to 6444)	72	51.42
Severe food insecurity (<4637)	34	24.29
Total	**140**	**100**

Figures in parentheses are index values

4.5.3. Assessment of food security through malnourishment

The details pertaining to the number of malnourished individuals in the households are given in Table 53.

Table 53. Extent of malnourishment in the households

Number of malnourished individuals	Number of households	Per cent
0	46	32.86
1	56	40.00
2	24	17.14
3	8	5.71
4	6	4.29
Total	**140**	**100**

From the table it is clear that in 57.14 per cent of the households one to two malnourished members were present and 10 per cent of the households had three to four malnourished members. Malnourished members were not present in 32.86 per

cent of the households. The relationship between the prevalence of malnutrition and food security is furnished in Table 54.

Table 54. Relationship between nutritional status and food security

Nutritional status	Food insecure	Food secure	Total
Malnutrition	6 (4.29)	88 (62.86)	94 (67.14)
No malnutrition	8 (5.71)	38 (27.4)	46 (32.86)
Total	**14 (10)**	**126 (90)**	**140 (100)**

From this, it could be concluded that 5.71 per cent of the households though having no malnourished individuals were having food insecurity and 62.86 per cent of the households with malnourished family members were found to be food secure.

4.5.4. Factors affecting food security

Multinomial Logistic Regression Analysis was carried out using the food security scores of USDA module which trichotomised the whole sample as food insecure, food insecure with moderate hunger and food insecure without hunger as dependent variables and family size, monthly income, food expenditure, food consumption, food purchase, protein, energy and iron intake as explanatory variables. The results are given in Table 55.

The data obtained were classified as food insecure, food insecure with moderate hunger, food insecure without hunger and food secure. The odds ratio was computed for each stage of transition mentioned above. Among the eight parameters under consideration, family size, food expenditure and energy intake were found to be significant in the first stage of transition i.e food insecurity to food insecurity with moderate hunger. The probability that small family size will improvise food insecurity with moderate hunger from total food insecurity is 80 per cent whereas the corresponding probability is 47.14 per cent in the case of better food expenditure and 55 per cent in the case of energy intake.

Table.55. Parameter estimates of Multinomial Logistic Regression

Stages of food security	Factors	Sig.	Exp(B)
Food insecurity	Intercept	0.618	
	Family size	0.025	4.401
	Income	0.689	1.000
	Food expenditure	0.088	0.901
	Food consumption	0.271	0.998
	Food purchase	0.392	0.997
	protein intake	0.621	1.019
	energy intake	0.134	0.998
	Iron intake	0.272	1.039
Food insecurity with moderate hunger	Intecept	0.098	
	Family size	0.018	3.273
	Income	0.122	0.999
	Food expenditure	0.907	1.004
	Food consumption	0.849	1.000
	Food purchase	0.446	1.001
	protein intake	0.261	1.023
	energy intake	0.291	0.999
	Iron intake	0.122	1.051
Food insecurity without hunger	Intecept	0.209	
	Family size	0.082	2.249
	Income	0.551	1.000
	Food expenditure	0.659	1.016
	Food consumption	0.775	1.000
	Food purchase	0.710	0.999
	protein intake	0.345	1.022
	energy intake	0.489	0.999
	Iron intake	0.594	0.950

In the next stage of transition that is from a stage of food insecurity with moderate hunger to a stage of food insecurity without hunger, among the different factors family size, income and iron intake were found to be significant. Here, the probability that small family size will improvise food insecurity with moderate hunger to a food insecurity without hunger is 77 per cent whereas it is 51 per cent in the case of better income and energy intake.

Finally to scale up from food insecurity without hunger to a state of food security, among the factors under consideration only family size was found to be significant. The probability that small family size contributes for this is 69 per cent. Thus, among the different factors considered, family size was found to be the most important factor followed by income food expenditure and energy intake.

The correlation of the various factors influencing food security was worked out in terms of access availability and utilization. Among the access parameters family size was found to be positively correlated with food insecurity (0.359). Among the availability parameters no correlation was found with food insecurity. Similarly no correlation was observed between the intake of nutrients (utilization parameters) and food security. However, a positive correlation was observed between consumption of food and purchase of food (0.316).

DISCUSSION

5. DISCUSSION

A critical and brief discussion of the major findings of the study is presented in this chapter under the following headings.

1. Socioeconomic status of the households
2. Food consumption pattern of the households
3. Nutritional status of family members
4. Food security of the households

5.1. Socioeconomic status of the households

In the present study, most of the households belonged to Hindu community. Lawrence (2003) also indicated that most of the households in the agricultural labourers of Trichur District belonged to Hindu community. Various studies conducted by Karuna (1993), Augustine (1993), Smitha (1999), Vijayan (2003) and Deepa (2009) also indicated the predominance of Hindu community among the labour households of Kerala.

Nuclear family system was noticed among 55 per cent of the households. This revealed the social trend universally observed where there is fading of joint family system with most of the joint families disintegrating into nuclear families. The present study endorces the studies conducted in Kerala by Anil *et al.* (2001), Ukkuru (2001), Prateesh (2000), Jyothi (2003), Lawrence (2003), Vijayan (2003), Archana (2008) and Deepa (2009) all of whom also observed the predominance of nuclear type families in the different labour households, especially among agricultural labour households. In the nuclear family system, the per capita availability of food and other resources will be higher than in joint family system and hence the nuclear family system observed among the agricultural labour households of Kuttanad might enhance their food security. Contradictory to the present finding, Aneena (2003) in a study conducted among fishermen community observed the predominance of joint family system among majority of the households.

Family size is a major factor influencing the nutritional status of its members and thus the food security of the households. Due to high literacy rate and better medical facilities available in Kerala, small family norm has become popular even in the remote villages. In the present study, the family size when analysed, it was seen that 79.29 per cent of the households had four to six members and 12.86 per cent had one to three members. Only 7.85 per cent of the households had seven to nine members. Thus, 92.15 per cent of the households could be categorised under small or medium sized with up to six members. Medium sized families were also observed by Jayanthakumari (1993), Smitha (1999), Lawrence (2003) Archana (2008) and Deepa (2009) among the households of agricultural labourers. However, Aneena (2003) indicated large family size due to the joint family system in the households of fishermen. One of the important reasons for the small or medium family size of agricultural labourers might be the nuclear family system observed among the households. The nuclear family system as well as the small family norm observed in the present study might have a direct influence on per capita income and per capita availability of food and in turn might have a direct impact on the food security of the households.

Kerala is the only state in the country with a sex ratio in favour of females. Though the sex ratio of India has improved from 933 in 2001 to 940 in 2012, in Kerala, the sex ratio is in favour of females. As per Census 2011, among the different states, the sex ratio of Kerala is the highest with 1084 females for 1000 males (Mathrubhumi Year Book,2012). In all other states, the sex ratio is adverse to women. In the present study also, the sex ratio of agricultural labour households was found to be 1108 for 1000 males. Studies conducted by Pratheesh (2000) and Lawrence (2003) also indicated a sex ratio of 1092 and 1277 females respectively per 1000 males among agricultural labour households. In contrast to the present finding, Jyothi (2003) indicated a sex ratio in favour of male members among the agricultural labour households of Palakkad District.

Age and sex based distribution of family members also indicated that among the total population, the child population in the age group of zero to 10 years was 17.47 per cent. The child population was found to be low when compared to adults.

Deepa (2009) also reported similar findings among the households of coir workers. This trend observed among the agricultural labour households is a favourable phenomenon since children in the family demand more time, attention and better food than adults and economically they are depended on adults.

Education plays an important role in determining how the resources are being utilised to achieve food security. Education of women in the family is very important to achieve food and nutritional security of the household members. Literacy level of the community or region is considered as one of the important indices used to ascertain the socioeconomic status. With respect to literacy, Kerala is in the top position with a literacy rate of 93.91 per cent (Mathrubhumi Year Book, 2012). The Human Development Report 2011 has patted Kerala for achieving the highest literacy rate. (Balaji, 2011). In the present study, it was seen that more than 70 per cent of male and female members of the selected households had attained up to high school education. Only 1.84 per cent of male and 4.71 per cent female members were found to be illiterates. Among the illiterates, majority were above 60 years of age.

In India, though the literacy level is very high, men have better education than women probably because of social discrimination against women. According to 2011 census, male literacy was reported to be 96.02 per cent compared to 91.98 per cent among females (Mathrubhumi Year Book, 2012). In the present study, slightly higher percentage of literacy was noticed among male members when compared to female members. Similar results were indicated by NIN (1996) Mathen (1998), Smitha (1999), Aneena (2003) and Lawrence (2003) among various labour households of unorganized sector. However, studies conducted by Anil *et al.* (2001) and Jyothi (2003) reported higher percentage of literacy among female members among dairy farmers and agricultural labour households of Kerala.

Since, the households of the present study were selected purposively from agricultural labourers, majority of the male and female members of the households were working as agricultural labourers, especially the family members between the age group of 18 to 60 years. Most of the male and female members above 60 years were not involved in any type of occupation.

Monthly income is a major factor influencing the economic status and in turn the household food security. The major source of income for all the selected households was found to be the wage they received as agricultural labourers. To a certain extent, 58.44 per cent of the households obtained through the sale of products like egg and milk from the domestic animals reared by them. Majority of the households (90.71%) had a monthly income in the range of Rs. 2000 to Rs.6000. Lawrence (2003) also indicated a lower monthly income in between Rs. 1000 to Rs.3000 among the agricultural labourer families of Thrissur District. Various other studies conducted in Kerala by Karuna (1993), Varma (1996), Udaya (1996), Smitha (1999), Jyothi (2003) and Aneena (2003) also indicated a mean monthly income below Rs. 3000 among the households of fishermen, agricultural labourers, casual labourers and farm women. Slightly higher income noticed among the households of the present study when compared to the previous studies might be due to the hike in the daily wages of men and women labourers over the years. In the present study, the daily wage of men and women members of the study area was found to be Rs. 350 and Rs. 250 respectively.

Monthly expenditure pattern of the households especially the percentage of income spent on food is another factor affecting the food security. The monthly expenditure pattern of the households of the present study indicated that 75.71 per cent of the households spent above 45 per cent of their monthly income for food. Similar findings were reported by Smitha (1999), Jyothi (2003), Lawrence (2003) and Deepa (2009). In contrast to the present finding, studies conducted by Augustine (1993) and Karuna (1993) among unorganised sector indicated that most of the families spent 65 to 75 per cent of monthly income on food. The lower expenditure incurred for the purchase of food items is mainly due to the fact that in Kerala the BPL families are getting food items especially cereals at a subsidised rate from the ration shop. In the present study also it was observed that all the selected households got rice and wheat through ration shop at a subsidised rate which also revealed the effectiveness of the public distribution system of the area.

The expenditure incurred for clothing, transport, fuel, education and electricity of majority of the households was found to be less than 10 per cent of their monthly income. Almost similar findings were reported by Karuna (1993), Udaya (1996), Jose (1998), Lawrence (2003) and Deepa (2009) in various labour categories. However, Jyothi (2003) reported that agricultural labourers involved in rice cultivation spent more than 20 per cent of their income for clothing, transport and electricity.

The findings of the present study indicated that majority (65%) of the households did not have any debt and only 35 per cent of the households had taken loan from either cooperative banks or nationalised banks. It was also seen that these households took loan for agriculture, marriage, education or for the purchase of vehicle or domestic animals. Contrary to this finding, the previous studies conducted by Udaya (1996), Smitha (1999), Lawerence (2003), Jyothi (2003), Aneena (2003) and Deepa (2009) indicated that majority of the households took loan to meet their family needs.

Land holdings of an household is considered as one of the important determinants indicating the resources of an household. The findings of the present study indicated that only 35.71 per cent of the households owned land. Among this, 34 per cent owned less than 50 cents and 50 per cent had 50 to 150 cents of land. Contrary to this finding, Lawrence (2003) observed less than 15 cents of land among majority of the agricultural labour households of Thrissur district.

Possession of domestic animals and use of the home produce are positively linked with the food and nutritional security of the households. The present study indicated that only 55 per cent of the households possessed domestic animals like cow, goat, hen, duck etc. Only 58.44 per cent received income from these domestic animals.

It was also seen that 50.71 per cent of the households have the habit of saving money and they invested in bank, LIC or chitty to meet their future necessities. Though, the monthly income was low, the households are trying to invest some

money as savings and thus to meet their future expenses. However, Lawrence (2003) and Jyothi (2003) indicated that none of the agricultural labour households of Thrissur and Palakkad Districts saved money for meeting their future demands. Deepa (2009) also indicated that majority of families of coir workers did not save money for future purpose. But, studies conducted by Shyna (1996), Udaya (1996) and Smitha (1999) among agricultural labour families revealed that in spite of their low income, majority of the families saved money from their income.

The housing conditions of the selected households indicated that majority (97.14%) lived in their own houses with brick as the wall material (70%), sheet (62.14%) and cement (67.86%) as the roofing and flooring materials respectively. Most of the houses (65%) had two to three rooms. Even, some of the houses used mud, wooden planks or thatching materials for walls, roofs and floors. Various studies conducted by Ranganathan (1996), Udaya (1996), Jose (1998) and Smitha (1999) also indicated that majority of the agricultural labour households resided in own houses. However, in contrast to the present observation of sheet as the roofing material, the previous studies conducted by the above authors reported tiled or concrete roofs in the houses. Though, electricity was present in 97.86 per cent of the houses, proper drainage facilities were not observed in any of the houses. Moreover, lavatory facilities were also absent in 47.14 per cent of the houses.

It was also seen that most of the households (71.43%) depended back waters as the souce of drinking water. However, all these families used this water after boiling. The previous studies conducted among the agricultural labour households by Sujatha (1990), Ranganathan (1996), Lawrence (2003), Jyothi (2003) and Deepa (2009) indicated that most of the families depended on wells or public taps as the sources of drinking water. Aneena (2003) indicated poor environmental hygiene with improper drainage facilities among the fisher men communities as was observed in the present study. Though, it is the right of every human being to have proper housing, sanitation, environmental hygiene and availability of safe drinking water, the housing and living conditions of the agricultural labour households of Kuttanad were found to be very poor.

Proper public conveyance was available for transport in all the selected areas and all the households resorted the public conveyance mainly bus as their means of transport. Above 60 per cent of the households possessed television and few of the households have radio also. These were the main sources of recreational items present in the households. Aneena (2003) also indicated radio and television as the main items available as recreational items in the households of fishermen. As observed in the present study, Jose (1998) also observed fewer recreational facilities among the casual labour households.

It was seen that all the households depended on primary health centre of the locality for medical treatment. Smitha (1999), Jyothi (2003), Lawrence (2003) and Deepa (2009) also indicated that majority of the labour households depended on the local primary health centre for immediate medical care.

The unhealthy personal habits of the family members indicated that in 50 per cent of the households, the male members were found to be addicted to smoking, alcohol or tobacco. Studies conducted by Karuna (1993), Thackur (1999) George and Domi (2002), also observed unhealthy habits mainly alcoholism among fishermen communities of Kerala and indicated that this is one of the major contributory factors for the socio economic backwardness of the households. Alcohol consumption and smoking also depress appetite and inhibit the desire for the intake of food.

5.2. Food consumption pattern of the households

To find out the food needs of the people at household, regional or national levels precise information on the food consumption pattern of the people are essential. The food consumption pattern of the selected households indicated that all were non vegetarians and they consumed rice as their staple food. Similar findings were reported in the labour households of different Districts of Kerala by Karuna (1993),

Ranganathan (1996), Udaya (1996), Mathen (1998), Jose (1998), Smitha (1999), Jyothi (1999), Lawrence (2003) and Vijayan (2003).

The meal pattern of the households indirectly indicates their dietary habits. Analysis of the meal pattern of the households revealed that they followed three meals a day pattern. Similar findings were observed by Jayanthakumari (1993), Karuna (1993), Udaya (1996), Smitha (1999), Rahman and Rao (2001), Jyothi (2003) and Lawrence (2003). However, Jose (1998) in a study conducted among casual labourers indicated that the families consumed more than three meals a day.

Advanced meal planning helps to complete the household chores quickly. However, in the present study, it was seen that none of the households were in the habit of planning their meals in advance. Contrary to the present finding, Lawrence (2003) indicated that majority of the agricultural labour families in the organised and unorganised sectors planned their meals in advance depending on the availability of foods. The households of the present study did not maintain a routine time schedule for consuming meals and indicated that they took food when they were hungry or according to convenience.

Regarding the consumption of raw foods, it was seen that none of the households consumed raw foods on a regular basis. Similar findings were reported by Udaya (1996), Smitha (1999), Jyothi (2003) among agricultural labour households. But, Lawrence (2003) indicated that 50 per cent of the agricultural labour households in the organised sector and 35 per cent in the unorganised sector included raw vegetables in their daily diet.

The economic status of the households and the local availability of food items are the two important factors which influence the frequency of use of different food items. The score computed on the basis of the frequency of use of various food items indicated that cereals, vegetables, fish and fats and oils were the most frequently used food items. Pulses, leafy vegetables, roots and tubers and fruits were the medium frequently used food items. Less frequently used items included milk and milk

products, egg and meat. Lawrence (2003) also observed cereals and fats and oils as the most frequently used food items and milk and milk products as the less frequently used item among the agricultural labourer households in the unorganised sector. Contrary to the previous studies conducted by Augustine (1993), Seshadrinath (1993), Smitha (1999), Jyothi (2003) and Lawrence (2003), it was seen that the agricultural labour households in the present study consumed fish on a regular basis and got a frequency score of above 75 per cent along with cereals, vegetables and fats and oils. This is mainly due to the fact that most of the households used to catch fish from the surrounding lake and included in their daily diet. However, the use of other food stuffs like egg, meat and milk and milk products rich in complete proteins were used less frequently in their diet.

Food expenditure is an important factor influencing the dietary habits. In the present study, it was found that nearly 67 per cent of the households spent only 10 to 35 per cent of the food expenditure for the purchase of cereals. About 10 to 28 per cent of the households did not spend any money for the purchase of milk, fruits, meat, fish and egg. For other food items like pulses, vegetables, fats and oils majority spent 5 to 15 per cent of amount spent on food items. Contrary to this, Lawrence (2003) indicated that most of the families of agricultural laboureres spent up to 50 per cent of their food expenditure for the purchase of cereals and less than 5 per cent of the families did not spend any money for the purchase of protective food items like egg, meat, fish and milk.

Pickling was found to be the most common preservation method adopted by the households. Most common storage method adopted was found to be drying and storing in tight containers. Similar preservation and storage methods were observed among the agricultural labour households of Thrissur District by Lawrence (2003).

The food purchase inventory conducted over a period of 15 days with respect to availability of foods among the households revealed that all items were purchased to a lesser extent when compared to the actual requirement of the households, thus, indicating lower availability of different foods . Vijayan (2003) in a study conducted

among the landless agricultural laboureres observed an inadequate availability of all foods except roots and tubers and fish. This calls for the need for nutrition education and dissemination of information on procuring balanced diet from available resources.

Agarwal (1980) reported lower food consumption among rural population than the minimum amount required for physical sustenance and healthy living. The food intake of the family members per consumption unit indicated that the intake of all food groups except flesh foods and fats and oils was significantly lower than that is required for healthy living. It was also seen that the households met only 3 to 14 per cent of RDA of vegetables which included leafy vegetables, other vegetables and roots and tubers as well as fruits and milk and milk products. Lawrence (2003), Jyothi (2003) and Archana (2003) also indicated decreased consumption of different food items among women agricultural labourers. It was also seen from the study that none of the selected households were consuming the required amount of leafy vegetables, milk and milk products and fruits. However, it was seen that 11.43 per cent, 8.57 per cent, 38.57 per cent and 54.29 per cent of the households consumed adequate quantities of cereals, pulses, fats and oils and fish respectively.

With respect to nutritional quality of the diet, it was seen that the mean per capita intake of all nutrients were significantly lower than the RDA. Similarly Lawrence (2003) also indicated decreased intake of all nutrients among the women agricultural labourers. Here also it was seen that the intake of various nutrients among 76 to 99 per cent of the households was lower than the suggested RDA. Thus, the adequacy of various foods and nutrients among the selected households were found to be very low.

5.3. Nutritional status of family members

Weight for age is the most sensitive index to assess the current nutritional status. In the present study, body weight of children, adolescents, adult and elderly of the selected households were taken and compared with the standards suggested by WHO (2006) and NNMB (2002) for respective age groups for both sexes.

The body weight of different age groups in the selected households when compared with the suggested standards for respective age groups and sex indicated lower body weight among both sexes except for girls less than one year, 9 to 12 years, 13 to 15 years as well as men aged 18 to19 years. Among these four groups, the body weight was found to be significantly higher than the standards suggested among girls in the age group of 9 to 12 years and men aged 18 to 19 years.

Height is an indicator of long term nutritional status. The height when compared with the reference standards, it was found to be lower than the standards for all age and both sexes except girls aged less than one year and 6 to 12 years. Though, the height of children below five years was comparatively lower than the standards among boys and girls, the deficit was found to be significantly low only among boys aged less than one year. Aneena (2003) also indicated height deficit among preschool children.

The pattern of prevalence of malnutrition among children below five years was interpreted on the basis of weight for age classification suggested by Gomez *et al.* (1956). It was seen that 50 per cent boys and 66.67 per cent girls were having different grades of malnutrition. Among this, majority of boys (33.33%) and girls (45.46%) were having grade I malnutrition. Grade II malnutrition was found among 12.5 per cent boys and 21.21 per cent girls. None of the girls had grade III malnutrition. However, 4.17 per cent boys suffered from grade III malnutrition. Mathen (1998) and Aneena (2003) in a study among preschool children also observed grade II and grade I malnutrition among most of the preschool children. However, Shyna (1996) observed high prevalence of grade II malnutrition among preschool children in the households of agricultural laboureres.

Height deficit can be considered as a measure of long duration or chronic malnutrition. As a result, children may look apparently normal, but when the height is compared with their age, considerable growth retardation may be evident. In the present study also when the children were categorised on the basis of height for age, only 50 per cent boys and 45.56 per cent girls had normal nutritional status. Rest of

the children suffered from different types of malnutrition in which 29.17 per cent boys and 24.24 per cent girls had marginal malnutrition. Severe malnutrition on the basis of height for age was found only among 4.17 per cent boys and 12.12 per cent girls. However, Aneena (2003) in her study among preschool children reported severe growth retardation among 47.6 per cent boys and 43 per cent girls on the basis of height for age. In contrast to this, Shyna (1996) and Jose (1998) revealed that majority of preschool children were having either marginal malnutrition or normal nutritional status on the basis of height for age.

A composite age independent index namely weight / height ^{2} ratio also known as quetlets index suggested by Rao and Singh (1970) indicates weight in relation to height. In the present study, on the basis of this index also, 50 per cent boys and 54.55 per cent girls were graded as having normal nutritional status and the rest 50 per cent boys and 45.45 per cent girls suffered either from moderate malnutrition or undernutrition. Almost similar results were indicated by Shyna (1996), Mathen (1998), Jose (1998) and Aneena (2003) among preschool children.

Mid Upper Arm Circumference is recognised as a good index of muscle development. According to Rao and Vijayaraghaven (1996), MUAC is a useful index not only to identify malnutrition but also mortality risk among children. In the present study, when the MUAC measurements were categorized into different grades on the basis of the classification suggested by Gopaldas and Seshadri (1987) all preschool children were found to be having normal nutritional status. Contrary to this, Aneena (2003) reported normal nutritional status among 42.9 per cent boys and 46.6 per cent girls on the basis of MUAC and the rest of the boys and girls suffered from moderate malnutrition. Since, MUAC is a good indicator of Protein Energy Malnutrition (PEM), it can be concluded that none of the preschool children in the selected households suffered from PEM.

The head / chest circumference ratio is a good indicator of the nutritional status of children in between 6 months to 5 years. On the basis of this index, 78.26 per cent boys and 71.88 per cent girls were graded as having normal nutritional status.

Similar findings were observed by Shyna (1996), Jose (1998) and Aneena (2003) among preschool children.

School age period is nutritionally important to build up body stores of nutrients required for rapid growth in adolescents. Malnutrition during this period will adversely affect school performance, body functions and physical growth. In the present study, mean weight and height of boys were found to be lower than the suggested standards. In the case of girls, the mean weight and height were better than the standards for both 6 to 8 years and 9 to 12 years except the weight of girls in the age group of 6 to 8 years. Sunita and Jain (2005) in a study conducted at Bihar among school age children in the age group of 6 to 12 years indicated lower body weight and height when compared to the standards. The mean height and weight of girls were found to be better than boys. On the basis of weight for age classification also, 79.16 per cent of the girls had normal nutritional status when compared to 56.41 per cent boys. Similar trend was noticed on the basis of height for age classification also. Sunitha and Jain (2005) also indicated better nutritional status among girls when compared to boys and indicated that girls were heavier and taller than boys after eight years

Adolescence is a vulnerable period of rapid growth and maturation in human development and is characterized by many physical and mental changes. In the case of adolescents also, the mean weight and height were found to be lower than the standards among boys and girls aged 13 to 15 years and 15 to 17 years except the weight of girls aged 13 to 15 years. Venkaiah *et al* (2003) indicated lower body weight and height among adolescents of rural India. The authors reported short stature and underweight among 24 per cent and 18.6 per cent of adolescent girls in rural India. Paul (1993), Suman (2000) and Paul (2001) also observed low body weight and height among adolescent boys and girls.

In the case of adolescents, better nutritional status was found among girls when compared to boys. Paul (2001) also indicated better nutritional status on the basis of weight and height among girls when compared to boys. As observed in the

present study, Venkaiah *et al* (2003) also observed high prevalence of under nutrition among boys. The extent of under nutrition as Chronic Energy Deficiency noticed in the present study was 34.37 per cent among boys and 25 per cent among girls. On the basis of BMI, Paul (2001) observed different grades of CED among 60 per cent adolescents which comprised of 60 per cent boys and 70 per cent girls. Thomachan (2001) indicated grade I and II malnutrition among 46 per cent and 23 per cent adolescent girls. Chaturvedi (1996) also indicated different grades of malnutrition among adolescents of Rajastan.

In the case adult men and women, the mean weight and height were found to be lower than the standards suggested for different age groups except the weight of adult men in the age group of 18 to 19 years. Lower body weight and height among women agricultural labourers was also reported by Cherian (1992), Smitha (1999), Jyothi (2003) and Lawrence (2003). But, in a study conducted in Thiruvananthapuram District, Jayanthakumari (1993) observed higher body weight among women agricultural labourers. Karuna and Prema (1993) also reported lower body weight and height among women engaged in fish vending.

In the present study, the prevalence of under nutrition was found to be low among adult men (4.40%) and women (7.66%). Lawrence (2003) in the study conducted among women agricultural laboureres observed 22 to 32 per cent CED among women agricultural labourers of organized & unorganized sectors. Udaya (1996) and Smitha (1999) also indicated almost similar nutritional status among farm women and women agricultural laboureres and reported various grades of CED among 19 and 21 per cent of women. Mohapatra (2001) reported CED among 52 per cent of Oriya women. Jyothi (2003) noticed various grades of CED among 43 per cent women agricultural labourers. Smitha (2003) indicated normal nutritional status on the basis of BMI among 51 per cent women. However, Jyothi (2003) observed still lower percentage of women with normal nutritional status on the basis of BMI.

With an improvement in l ife expectancy, care of the aged is also becoming very important. In the present study, the mean weight and height of elderly were

found to be lower than the standards both among males and females. Contrary to this, Jose (2001) observed an higher body weight among elderly. However, the mean height was found to be lower than the standards. Better nutritional status on the basis of BMI was observed among elderly males when compared to females in the present study. Contrary to this observation, Ariappa *et al*. (2004) indicated high prevalence of chronic energy deficiency among elderly males in rural India when compared to females.

The Body Mass Index of adult men and women, adolescent boys and girls in the age group of 13 to 17 years and elderly men and women computed to assess the chronic energy deficiency and thus the current nutritional status of family members indicated normal nutritional status among 53.13 to 73.62 percent male and 46.88 to 69.85 per cent females with a BMI in the range of 20 to 25kg/m^2. Obesity was found to a maximum of 10.99 per cent among these three groups with the highest among adult men and women. The percentage of under nourished males and females varied from 4.40 to 34.37 per cent among men and 7.66 to 31.25 per cent among women with the highest percentage among adolescent boys and elderly women.

An in depth study to assess the actual food and nutrient intake of women and preschool children conducted by one day food weighment survey indicated that the intake of all food groups except fats and oils, flesh foods and fruits was lower than the RDA suggested by ICMR (2010) for an adult women engaged in moderate activity. The intake of flesh foods mainly fish and fats and oils were found to be higher than the RDA. The same trend was observed in the food intake of the households conducted through recall survey. Agarwal (1980) also reported lower food consumption than the minimum requirement for physical sustenance required for healthy living among the rural population. Jyothi (2003) reported decreased intake of all food groups except other vegetables among women agricultural labourers. However, Lawerence (2003) indicated high intake of flesh foods among women agricultural labourers in the organised sector. In concordance with the results of this study, Seshadrinath (1993) and Seralathan *et al*. (1993) reported that the diets of women agricultural labourers and farm women respectively were deficient in all food

groups recommended for a balanced diet. Usha *et al.* (1990) also reported lower intake of all food groups except roots and tubers among farm families. However, Smitha (1999) observed higher intake of cereals and other vegetables by women agricultural labourers. In the present study, the intake of green leafy vegetables was found to be zero among women. Similar to this, lower intake of green leafy vegetables in the diet of women agricultural labourers of Kerala was reported by Cherian (1992), Jyothi (2003) and Smitha (1999). However, studies conducted by NNMB (1996) indicated increased consumption of protective foods like pulses, green leafy vegetables, milk and milk products in the dietaries of rural Indian population.

With respect to the nutritional quality of the diet consumed by women, it was seen that the intake of most of the nutrients was significantly lower than the RDA. The intake of fat was found to be high. Jyothi (2003) and Lawrence (2003) also indicated reduced intake of nutrients among women agricultural labourers. Reduced energy consumption in the dietaries of women in Southern and Northern India was reported in the studies conducted by Ajula *et al.* (1993), Augustine (1993), Udaya (1996) and Smitha (1999). Deficiencies of protein, calcium, iron and retinol in the diet of women was reported by Udaya (1996) in her study among farm women. As in the present study, deficient intake of Vitamin A in the diet was reported by Kaur and Sood (1988), Agarwal (1991), Cherian (1992), Ajula *et al.* (1993), Udaya (1996), Smitha (1999), Jyothi (2003) and Deepa (2009).

In the case of pre school children, except cereals the intake of all food groups was found to be lower than the RDA. Among different nutrients, only the protein intake was fount to be satisfactory. Bhat and Dahiya (1985) and Aneena (2003) also indicated lower intake of all food groups among preschool children. The increased intake of cereals noticed among children is mainly from the supplementary foods provided through the Balwadies. As observed in the present study, Aneena (2003) also indicated high intake of proteins among preschool children.

Clinical examination is the most effective measure to find out the nutritional deficiencies among individuals. The results of the clinical examination to find out the

deficiency symptoms among the selected women and preschool children of the present study indicated different clinical manifestations related to nutritional deficiencies both among women and children. Among the different symptoms, dental caries, followed by face and tongue and mild form of angular stomatitis were observed among 50 to 85.71 per cent women. Among preschool children also, nearly 89.29 per cent suffered from dental caries. The other symptoms were noticed only among 3.57 to 28.57 per cent of children. Though, the appearance of majority of preschool children was found to be good, the appearance of 85.71 per cent women was found to be poor. Better nutritional status on the basis of clinical manifestations observed among preschool children might be due to the care taken by the mothers and the supplemnatry foods they get from balwadies. In accordance to these findings, Udaya (1996), Smitha (1999), Lawrence (2003), jyothi (2003) and Deepa (2009) also indicated dental caries, angular stomatitis and pale conjunctiva among women. Cotradictory to this finding, Jayanthakumari (1993) and Chandralekha (1993) reported absence of clinical manifestations of nutritional deficiencies among farm women and women workers of tata tea estates of Kerala.

Biochemical examination of blood showed that the haemoglobin level of nearly 90 per cent of women were lower than the normal haemoglobin level of 12 g per 100ml. Only 10.72 per cent had a normal haemoglobin level. Nutritional anaemia has been reported as a major micro nutrient deficiency among Indian women of reproductive age. NIN (2007) indicated 89.2 per cent prevalence of anaemia among non pregnant non lactating women of Kerala and 75.2 per cent prevalence in India. Jyothi (2003) in her study among women agricultural labourers involved in rice cultivation indicated lower haemoglobin level among 100 per cent of samples. Ranganathan (1996) and Deepa (2009) also indicated low haemoglobin among 85 per cent of women coir workers of Kerala. The low haemoglobin level noticed in the present study is mainly due to the low intake of iron among the respondents. This also could be related to the complete lack of green leafy vegetables in the diet of women as noticed in the weighment survey. Low haemoglobin level noticed among the respondents also confirms the clinical manifestations of pale face, one of the important symptoms of anaemia noticed among women. The prevalence of anaemia

noticed in the present study is similar to the prevalence noted by NIN (2007) among non pregnant non lactating women of Kerala.

Among the respondents with anaemia, 40 per cent of women had mild anaemia and 52 per cent suffered from moderate anaemia. Only 8 per cent had severe anaemia with a haemoglobin value less than 7g per 100ml of blood. Deepa (2009) noticed mild form of anaemia among 71 per cent of women coir workers.

5.4. Food security of the households

In the present study, it was found that about 48.57 per cent of the selected households were food secure. Lawrence (2003) indicated food security among 26.67 per cent of agricultural labour households. Food security was found to be more in the households without children. Among the food insecure house holds (51.43 %), 25.72 per cent were found to be having food insecurity with moderate hunger and 15.71 per cent had food insecurity without hunger. Among 10 per cent of the households food insecurity with severe hunger was also noticed. Food insecurity was found more among the households with children i.e 59.62 percent and 27.78 per cent without children. Lawrence (2003) also indicated more food insecurity in the agricultural labour households with children. Studies conducted by Kigutha *et al* (1998), Albert and Sanjur (2000) and Nnakwe and Yegamma (2002) indicated higher percentage of food insecurity in the households with children. Nord *et al* (2001) also indicated food security among 83 per cent and 92 per cent of the households with and without children.

On the basis of access, availability and utilization of food also it was seen that only 24.29 per cent of the households were food secure. Moderate and severe food insecurities were noticed respectively among 51.42 per cent 24.29 per cent of the house holds. Mekuria and Moletsane (1996) observed food insecurity among 58 per cent of the house holds in the selected districts of Northern Province. Blumberg *et al* (1999) reported food insecurity with and without hunger among 0.3 per cent and 97.7 per cent of the households in Kenya. Vijayaraghavan *et al.* (1998) in a study

conducted among the households of low socioeconomic background in the backward areas of Orissa also reported food insecurity among 92 per cent of the households. Studies conducted by Ray *et al* (2000) and Kasper *et al* (2000) reported food insecurity among 40 to 48 per cent of the families. While Derrickson *et al*. (2001) reported food security among 85 per cent of the households. Athulya (2012) indicated food insecurity among 89 per cent of the households of vegetable growers of Thiruvananthapuram district. Among these households 62 per cent had food insecurity without hunger, 18 per cent had food insecurity with moderate hunger and 9 per cent suffered from severe food insecurity. Latheef (2011) also indicated food insecurity among 92 per cent of the households of paddy cultivators of Thiruvananthapuram district.

On the basis of the assessment of food security through malnourishment, it was seen that 5.71 per cent of the households though having no malnutrition had food insecurity and 62.86 per cent of the households with malnutrition were found to be food secure. This could be due to the fact that the measure of malnutrition was through Body Mass Index, weight for age and height for age which was the actual measurements of the individuals to assess nutritional status. The food security status of the households using the USDA (2000) module was assessed through an inter active which may not contain the realistic situation as the respondents may have their own way of response.

Among the different factors affecting food security, family size was found to be the most important factor during all the three stages. The odds ratio for family size, food expenditure and energy intake was found to be significant for the first stage of transition whereas family size, income and iron intake were significant during the second stage of transition. During the final stage of transition that is from food insecurity without hunger to a stage of food security, only family size was found to be significant. A positive correlation was also observed between family size and food insecurity. However, Manan (1995) indicated level of education, income and monthly expenditure as the important socioeconomic variables influencing food security. Vijayaraghavan *et al* (1998) observed low per capita income, high level of illiteracy,

non ownership of agricultural land and lower agricultural production as the major factors influencing food security. According to Albert and Sanjur (2000), per capita monthly income, social class and number of children in the households were important determinants of food security. Prema (2001) indicated the location of residence, income, family type and size as the factors which have direct relationship with food security.

The correlation worked out to find out the relationship between various factors influencing food security in terms of access, availability and utilisation also indicated a positive correlation between food consumption and food purchase. This means that whenever they had the capacity to purchase they were in a position to consume the whole purchase. This does not in any way guarantee the purchase through out the year. Altogether, it could be concluded that the nuclear family system prevailing in the area will ensure food security along with better income, better energy and iron intake.

Summary

6. SUMMARY

The study entitled "Food security in farm labour households of Kuttanad" was conducted to assess the extent of food security and to identify the factors influencing the food security of farm labour households of Kuttanad. All the seven agro ecological zones of Kuttanad namely Upper Kuttanad, Lower Kuttanad, North Kuttanad, Coastal Kuttanad, Kayal, Purrakkad and Vaikom were selected for the study. From each of these seven zones, 20 farm labour households were selected randomly in which at least one adult member of the household is engaged as agricultural labourer and their major source of income is derived from farm labour. Thus, 140 households constituted the sample size. For a detailed study, four women in the age group of 25 to 50 years and four preschool children in the age group of 3 to 5 years were selected from each agro ecological zone. Thus, the detailed study was conducted among 28 women and 28 preschool children.

The food security of the selected households was ascertained by assessing the three dimensions of food security namely access, availability and utilisation of food. Food access and availability were determined by assessing socioeconomic status, food consumption pattern, details on food purchase and food adequacy of the households. The third dimension of food security namely utilisation was determined by assessing the nutritional status of family members. Overall food security was also determined using the food security module suggested by USDA.

The socioeconomic status and food consumption pattern of the households were assessed using a pretested interview schedule. Details on food purchase was collected by conducting a food purchase inventory for 15 days. Food adequacy of the households was determined by conducting a dietary recall survey for three days.

The nutritional status of the family members was determined by taking anthropometric measurements of the family members. The nutritional status of the family members was also conducted through a food weighment survey to assess the actual food and nutrient intake, clinical examination to detect deficiency symptoms and biochemical examination of blood for haemoglobin to determine the prevalence of anaemia.

Socioeconomic status of the households indicated that 90 per cent belonged to Hindu community and 55 per cent followed nuclear family system. Nearly 79 per cent of the households had 4 to 6 family members. Age and sex wise composition of the members showed that 46.99 per cent of the total population was in the age group of 20 to 49 years and comprised of 47.31 per cent male and 46.70 per cent female members. Educational status of family members above 18 years of age indicated that more than 95 per cent were literates. Since the households were selected purposively from agricultural labourers majority of the male (71.89%) and female (54.51%) members were found to be working as agricultural labourers.

The monthly income and per capita income of most of the households varied from Rs 2000 to Rs. 8000 and Rs. 501 to Rs. 1000 respectively. The monthly expenditure pattern of the households indicated that 50.71 per cent spent above 55 per cent of their income for food. Most of the households (64 to 96%) spent less than 10 per cent of their income for clothing, transport, fuel, education and electricity. Only 35.71 per cent of households owned land and 70 per cent of them had up to 100 cents of land and cultivated paddy, banana and vegetables. Only 35 per cent of the people borrowed money from co operative bank and nationalized bank mainly for agricultural purposes.

The housing conditions indicated that majority of the households had own houses made of brick as the wall material and sheet as the roofing material and cement as the flooring material. Most of the houses had 2 to 4 rooms. Proper toilet facilities were present only in 53 per cent of the houses. None of the houses had drainage facilities. Electricity facilities were found in 98 per cent of the houses. Most of the households collected drinking water from back waters and only 29 per cent of the households collected water from public tap.

All the families used the facilities available in primary health centre of their locality for health care. Fever, diarrhoea, measles, and jaundice were found to be the important morbidities prevalent in the locality during the previous year.

Food consumption pattern of the households indicated that they consumed rice as their staple food and followed non vegetarian food habit. None of the households planned their meals in advance and did not follow specific time schedule for taking meals. Fifty nine per cent of the households cooked meals thrice daily. Food expenditure pattern revealed that about 86 per cent of the households spent 10 to 50 per cent of the amount spent on food per month for the purchase of cereals. For the purchase of milk, fruits, meat and fish 10 to 28 percent did not spend any money.

Cereals, fats and oils, vegetables and fish were the most frequently used food items and milk, meat and egg were used to a lesser extent by the households. Details on the mean quantity of the food purchased by the households also indicated that the mean quantity of different food items purchased were far below the mean RDA. The results pertaining to food adequacy of the households revealed that intake of all food groups except flesh foods mainly fish was lower than the actual requirement. Only 3 to 14 per cent of the RDA was met for leafy vegetables, roots and tubers and other vegetables. The mean nutrient intake of the family members also indicated a decreased intake of all nutrients.

The nutritional status of the family members assessed through anthropometric measurements indicated that on the basis of weight for age classification, 50 per cent of boys and 67 per cent of girls below five years suffered from different grades of malnutrition. Among this, majority had grade 1 malnutrition. On the basis of height for age classification also 50 per cent boys and 55 per cent girls below five years had different grades of malnutrition. On the basis of MUAC all children had an MUAC above 13.5cm and were categorized as having normal nutritional status. The head/chest circumference ratio indicated normal nutritional status among 78 per cent boys and 72 per cent girls.

On the basis of weight for age and height for age classifications, 65.08 per cent and 71.43 per cent children in the age group of 6 to 12 years respectively had normal nutritional status. None of the children in this age group suffered from severe malnutrition on the basis of weight for age classification.

To assess the nutritional status of adolescents, adults and elderly, BMI computed with weight and height measurements indicated that 34.37 percent adolescent boys and 25 per cent girls were undernourished with a BMI less than $18.5kg/m^{2.}$ Nearly 53 per cent boys and 65 per cent girls were having normal nutritional status with a BMI in between 20 to $25kg/m^2$. In the case of adults and elderly majority of men and women were categorized as normal on the basis of BMI.

The actual food and nutrient intake of women and preschool children indicated that the intake of all food items except flesh foods mainly fish and fats and oils among women and cereals among preschool children were below the RDA. It was also seen that the intake of milk, vegetables, roots and tubers and fruits was very low when compared to RDA among both women and preschool children. In the case of nutrients, the intake of most of the nutrients was below the RDA suggested for both women and preschool children.

The clinical manifestations of deficiency diseases indicated mild angular stomatitus, dental caries, mottled teeth, pale tongue and pale face as the important symptoms among women and preschool children. About 90 per cent of women were found to be anaemic on the basis of haemoglobin level and among this, 52 per cent were graded as moderately anaemic with a haemoglobin level in between 7 to 10g per 100ml of blood.

The overall food security status of the households assessed using the USDA module indicated that only 48.57 per cent of the households were food secure and the rest suffered from different types of food insecurity. Among the food secured households also, better food security status was observed in the households without children. In the case of food insecure households also, ten percent had food insecurity with severe hunger and 25.72 per cent had food insecurity with moderate hunger. On the basis of access, availability and utilization of food, only 24.29 per cent of the households were found to be food secure. The relationship between nutritional status and food security when assessed indicated that 5.71 per cent of the households though not having malnourished individuals were found to be food insecure and 62.86 per cent of the households with malnourished members were found to be food secure.

Among the different factors influencing food security, it was seen that at the basic level, family size, food expenditure and energy intake were found to be the most influential parameters influencing food security. At the second level, for the transition from food insecurity with moderate hunger to food insecurity without hunger family size, income and iron intake were the influential factors. At the third stage, it was seen that family size alone is the factor influencing food security. Thus, it could be concluded that the nuclear family system prevailing in the area will ensure food security along with better income and better energy and iron intake.

Future line of research

1.   Food security of the area should be conducted among large sample and the influence of seasonal variation and climate should be investigated.
2.   A new survey module has to be developed to assess household food security which could elicit better information on the nutritional status of the family members.

Suggestions

1. Awareness programmes on nutrition, environmental and personal hygiene, should be conducted among the population.

2. Steps should be taken to improve the drinking water facilities and toilet facilities in the area.

3. Steps should be taken to increase the wages of agricultural labourers.

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*Original not seen

APPENDICES

Appendix. I

INTERVIEW SCHEDULE TO ELICIT INFORMATION ON SOCIOECONOMIC STATUS OF THE HOUSEHOLDS

1. Name of the respondent:

2. Address:

3. Place of survey:

4. Panchayath:

5. Ward No, House No:

6. Type of the family: Joint / Nuclear

7. No. of adults:

8. No. of children:

9. Religion:

10. Family size:

11. Composition, education and occupation of family members

SI. No	Relationship with the respondent	Age	Sex	Occupation	Educational status							Income (Rs)
					Illiterate		Literate					
					Know to write & read	Don't know write & read	Primary	HS	Hr. Sec	College		

12. Do you have any other source of income? : Yes / No

   If yes, specify, income and source of income

 a) Do you have your own land? : Yes / No

i) If yes, total area:

ii) Area under cultivation:

iii) Details of land holdings:

b) Do you cultivate any food crops in the land? : Yes / No

i) If yes, area under cultivation:

ii) Details regarding the cultivation of food crops

SI. No	Name of the crop	Total production per year	Quantity used at home	Quantity sold	Income

c) Do you have kitchen garden in your home? Yes / No

If yes specify,

SI. No	Items of cultivation	Use of produce			Income (Rs)
		By the family	Sale	Gift	

13. Do you have any domestic animals? : Yes / No

If yes, specify

a) From where did you get it? : Purchased

Gift

Govt.

Others (specify)

i) Give the details of the produce from domestic animal:

a) Do you receive any food item as wage or free of cost? : Yes / No

i) If yes, specify the items & source from which received?

SI. No.	Item	Source	Qty received

ii) How frequently you receive?

14. Do you have the habit of saving money? : Yes / No

    a) If yes, mode of savings;

        i)   Bank accounts

        ii)   LIC

        iii)   Chit funds

    b) Have you taken any loan? : Yes / No

    If yes, give details

SI. No	Source of loan	Amount	Duration of loan			Purpose for which taken	Mode of payment
			ST	MT	LT		

15) Monthly expenditure pattern

SI. No	Items	Amount spent / month	Mode of payment	% of total income
a.	Food			
b.	Clothing			
c.	Shelter			
d.	Transport			
e..	Recreation			
f.	Education			
g.	Electricity			
h.	Health care			
i.	Fuel			
j.	Luxury			
k.	Savings			
l.	Remittance			

16. Housing conditions:

a) Type of house

House	Roof	Wall	Floor	No. of rooms
Own Rented	Thatched Tiled Concrete Sheet Terrace Any other, specify	Mud Brick Stone Tiled Any other, specify	Concrete Tiled Mosaic Marble Granite Any other, specify	1 2 3 4 5 6 more than 6

Necessities available

i) Source of drinking water:

Own well / Common well / Public tap / Municipality / Corporation

ii) Light: Electricity / Solar / LPG/ Kerosene / Any other, specify

iii) Latrine facility: Own / Common / No latrine

iv) Drainage facilities: Open / Closed / Nothing.

v) Recreational facilities: Present / Absent

If present, give details

A) Electrical appliances: Radio / TV / Transmitter / Tape recorder / VCR / VLP / DVD / Home theatre / Computer / Mobile / Lap top / Eye pod / Any others, specify

B) Printed media: News paper / Weekly magazine / Children's books / Journals / Monthly magazine / Bi monthly magazine/ any others specify

vi) Transport facilities: Bus / Van / Bi cycle / Motor bike / Car / Jeep / Tempo / Lorry / Auto rickshaw / Auto / Share auto/ boat/ others (specify)

vii) Facilities available at home:

Separate rooms: For the child / Entertainment / Dining / Sleeping / Cooking / Worshipping

17. Details of health care facilities: PHC / Private hospital / Medical college / Maternal & child health centre / Ayurvedic / Homeopathic / ICDS/ anganwadi/ Others

a) Are you using the health care facilities available in your locality? : Yes / No

If yes, always / some times

b) Distance to the health care centre?

c) Morbidity prevalent in the locality for the past one year:

Diarrhea / Measles / Fever / Tuberculosis / Respiratory diseases / Jaundice / Others (specify)

i) In your family, anybody have affected by any one of diseases/

If yes, Specify

Name of the disease:

Name of the individual:

d)Details of personal habits:

Do you or any member in your family have the habit of

i)   Smoking: Yes / No

ii)   Tobacco chewing: Yes / No

iii)   Alcohol consumption: Yes/ No

iv)   Others(Specify):

Appendix. II.

INTERVIEW SCHEDULE TO COLLECT INFORMATION ON FOOD CONSUMPTION PATTERN OF THE HOUSEHOLDS

1. Name of the respondent　　　:

2. Place of survey　　　　　　:

3. Food habit　　　　　　　　:　Vegetarian/Non-vegetarian

4. Name of staple food　　　　:

5. Details of food expenditure　:

Sl. No.	Food items	Quantity purchased	Total cost	Percentage of total expenditure	Purchase made by cash/credit
1	Cereals				
2	Pulses				
3	Vegetables, roots and tubers, other vegetables				
4	Fats and Oils				
5	Milk and milk products				
6	Fruits				
7	Meat				
8	Fish				
9	Egg				
10	Others				

6. Place of purchase of food materials?
   Fair price shops / society/ private shops.

7. Details of frequency of use of various food items

Sl. No.	Food items	Frequency of use in a week				Monthly	Occasionally	Never
		Daily	Thrice	Twice	Once			
1	Cereals							
2	Pulses							
3	Green leafy vegetables							
4	Other vegetables							
5	Roots and tubers							
6	Fruits							
7	Fats and oils							
8	Milk and milk products							
9	Meat							
10	Fish							
11	Egg							

8. Details about frequency of meals per day
   Once/Twice/Thrice/More than three

9. Details about meal planning
   Do you plan your meals in advance? Yes/No
   If yes, what is the basis of planning?
   a) Total family requirement
   b) Food stuffs available
   c) Likes and dislikes of family members
   d) Foods available

10. Details of consumption of raw food items
    i) Do you consume any raw food items? Yes/No
       If yes, specify
    ii) Do you find any advantage or disadvantage of eating raw food? Yes/No
       If yes, specify

11. Do you use left over food items? Yes/No
    If yes, specify

12. Do you use specific time schedule to consume meals? Yes/No

If no, what is the basis of intake of meals?

a) Take food when hungry
b) Take food according to convenience

13. Do you take food from outside: Yes/No

14. How many times you cook meals in a day.
Once/Twice/Thrice/More than three times

15. Details about food preservation

i) Do you preserve any food items in your home? Yes/No
If yes, specify

Preservation of food items

Sl.No.	Food items	Methods used	Period over which preserved
1	Cereals		
2	Pulses		
3	Fruits		
4	Milk		
5	Meat		
6	Vegetables		
7	Fish		
8	Others		

ii) Do you buy any preserved food items from outside? Yes/No
If yes, Give details,

iii) Do you know any local practices on food preservation? Yes/ No
If yes, give details,

iii) Do you practice this at home? Yes/ No.
iv) Is there any advantage in that preserved food? Yes/no
If yes, give details?

16. Details of storage of food items
    i) Do you store any food items in your home? Yes/No
       If yes, specify

Sl.No.	Food items	Method of storage	Period of storage
1	Cereals		
2	Pulses		
3	Fruits		
4	Milk		
5	Meat		
6	Fish		
7	Vegetables		
8	Egg		
9	Others		

    ii) Do you employ any specific treatment before storing food items? Yes/No
        If yes, specify

17. Food intake of households (Recall survey):

Day	Menu	Ingredients	Quantity used
First day			
Break fast			
lunch			
Evening tea			
Dinner			
Second day			
Break fast			
lunch			
Evening tea			
Dinner			
Third day			
Break fast			
lunch			
Evening tea			
Dinner			

24. Details on food purchase inventory

SI. No.	Name of item purchased	Quantity purchased (day)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Appendix. III.

SCHEDULE FOR CLINICAL ASSESSMENT

1.   Sex:
2.   Age:
3.   Height:
4.   Weight:
5.   General appearance: 1. Good
                               2. Fair
                               3. Poor
                               4. Very poor

6. Eyes

  a) Conjuctiva

   i) Xerosis :   1. Absent, glistening and moist
                      2. Slightly dry on exposure for a minute
                           /lack of luster
                      3. Conjunctiva dry and wrinkled
                      4. Conjunctiva very dry and bitot's spots
                         present

   ii) Pigmentation: 1. Normal colour
                      2. Slight discolouration
                      3. Moderate browning in patches
                      4. Severe earthy discolouration

   iii) Discharge: 1. Absent
                      2. Watery, excessive larchymation

    b) Cornea

   i) Xerosis: 1. Absent
                      2. Slight dryness and
                        diminished sensibility
                      3. Haziness and diminished transparency
                      4. Ulceration

   ii) Vascularisation: 1. Absent
                      2. Corneal infection
                      3. Vascularization of cornea

   iii) Folliculosis: 1. Absent
                      2. A few granules
                      3. Lids covered with extensive granules
                      4. Hypertrophy

  d) Functional

   i) Night blindness: 1. Absent
                      2. Present

7. Mouth
a) Lips
  i) Condition: 1. Normal
                          2. Angular stomatitis,mild
                          3. Angular stomatitis, marked

b)Tongue
  i) Colour: 1. Normal
                          2. Pale but coated
                          3. Red
                          4. Red and raw
  ii) Surface: 1. Normal
                          2.Fissured
                          3. Ulceration
                          4. Glazed and atropic

c) Buccal mucosa
  i) Condition: 1. Normal
                          2. Bleeding and/or gingivitis
                          3. Pyorrhoea
                          4. Retracted
                     d) Gums
    Condition: 1. Normal
    Bleeding
e) Teeth
  i) Fluorosis: 1. Absent
                          2. Chalky teeth
                          3. Pitting of teeth
                          4. Mottled and discoloured teeth
  ii) Caries: 1. Absent
                          2. Slight
                          3. Marked
8. Hair
  i) Condition: 1. Normal
                          2. Loss of luster
                          3. Discoloured and dry
                          4. Spares and brittle
9. Skin
  i) General appearance:1. Normal
                          2. Loss of luster
                          3. Dry and rough or Crazy pavement
                          4. Hyperkeratosis, phrynoderma
  ii) Elasticity: 1. Normal
                          2. Diminished
                          3. Wrinkled skin
10. Face: 1. Normal
                          2. Nasolabial seborrhea
                          3. Symmetrical suborbit pigmentation

4. Moon face
11. Oedema
    i) Dstribution: 1. Absent
                          2. Oedema on dependent parts
                          3. Oedema on face and dependent parts
12. Bones
    i) Condition: 1. Normal
                          2. Stigmata of past rickets
13. Alimentary
    i) Appetite: 1. Normal
                          2. Anorexia
    ii) Stools: 1. Normal evacuation
                          2. Diarrhoea
    iii) Liver: 1. Not palpable
                          2. Palpable
    iv) Spleen: 1. Not palpable
                          2. Palpable

Appendix. IV

FOOD SECURITY CORE MODULE

1. Stage 1. Which of these statements best describes the food eaten in your household in the last twelve month.
a. We have enough of the kinds of food we want to eat.
b. We have enough food but not always the kinds of food we want
c. Some times we do not have enough to eat.
d. Often we do not have enough to eat.

1a. **if the answer is c or d in question No.1,**

Why you don't always have enough to eat (mark all that apply)

a) Not enough money for food

b) Not enough time for shopping or cooking.

c) Very difficult to go the market.

d) On dieting

    e) Not able to cook or eat due to health problems.

1b. **If the answer is 'b' in question No.1**

Why you don't always have the kinds of food you have want to eat

a) Not enough money for food.

b) Kinds of food required are not available.

c) Not enough time for shopping or cooking

d) Too difficult to go to the market.

e) On a special diet.

For the following statements please put tick mark for the answers for the last 12 months.

2. We are worried whether our food would run out before we get money to buy more in the last 12 months.

a) Often true   b) Some times true   c) Never true   d) Refuses

3. The food we brought just didn't last and we didn't have money to get more in the last 12 months.

A) Often true   b) Some times true   c) Never true   d) Refuses

4. We could not afford to eat balanced meals in the last 12 months.

a) Often true   b) Some times true   c) Never true   d) Refuses

If the family is having children below 18 years ask

5. We relied on only a few kinds of low cost food to feed our children because we were running out of money to buy food.

a) Often true   b) Some times true   c) Never true   d) Refuses

6. We could not feed our children balanced meal because we couldn't afford that

a) Often true   b) Some times true   c) Never true   d) Refuses

Stage. 2. If the answers for questions 2 to 6 is often true or sometimes true or the response is 'c' or 'd' to question no.1 then continue stage.2. Otherwise skip to end. If there are children below 18 in the household.

7. Our children were not eating because we just couldn't afford enough food in the last 12 months.

A) Often true   b) Some times true   c) Never true   d) Refuses/ Don't know

8. In the last 12 months did you or other adults in your households ever cut the size of meals or skip meals because there wasn't enough money for food.

Yes/No

If yes, how often did this happen

a)   Almost every month   b) Some months but not every month   c) Only 1 or 2 months

d)   Refused / Don't know.

9. In the last 12 months did you ever eat less than you felt you should because there wasn't enough money to buy food?

Yes/No/Refused / Don't know.

10) In the last 12 months, when you were hungry you didn't eat because you could not afford enough food

Yes/No/Refused / Don't know

11. In the last 12 months, did you loose weight because you didn't have enough money for food

Yes/No/Refused / Don't know

If the answer is yes to questions 7 to 11 please ask 12 to 16.

12. In the last 12 months, did you or other adults did not eat for a whole day because there wasn't enough money for food

Yes/No/Refused / Don't know

If yes, how often did this happen.

b)   Almost every month   b) Some months but not every month   c) Only 1 or 2 months

d)   Refused / Don't know.

13. In the last 12 months, did you ever cut the size of childrens meals because there was not enough money for food?

Yes/No/Refused / Don't know

14. In the last 12 months, did the children ever skip meals because there was not enough money for food?

Yes/No/Refused / Don't know

If yes, how often did this happen

c)   Almost every month   b) Some months but not every month   c) Only 1 or 2 months

d)   Refused / Don't know.

15. In the last 12 months, was your child hungry because you just couldn't afford more food?

Yes/No/Refused / Don't know

16. In the last 12 months, did your child ever not eat for a whole day because there was n't enough money for food?

Yes/No/Refused / Don't know

Appendix. V

FOOD SECURITY SCALE VALUES AND STATUS LEVELS CORRESPONDING TO NUMBER OF AFFIRMATIVE RESPONSES

Number of affirmative responses		1998 food security scale value	Food security status level	
(Out of 18) **Households with children**	(Out of 10) **Households without children**		**Code**	**Food security status**
0	0	0	0	Food secure
1	1	1		
		1.2		
2		1.8		
	2	2.2		
3		2.4	1	Food insecure without hunger
4		3		
	3	3		
5		3.4		
	4	3.7		
6		3.9		
7		4.3		
	5	4.4		
8		4.7	2	Food insecure with hunger moderate
	6	5		
9		5.1		
10		5.5		
	7	5.7		
11		5.9		
12		6.3		
	8	6.4		
13		6.6	3	Food insecure without hunger
14		7		
	9	7.2		
15		7.4		
	10	7.9		
16		8		
17		8.7		
18		9.3		

FOOD SECURITY IN FARM LABOUR HOUSEHOLDS OF KUTTANAD

By

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ABSTRACT OF THE THESIS

**Submitted in partial fulfillment of the
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𝔐𝔞𝔰𝔱𝔢𝔯 𝔬𝔣 𝔖𝔠𝔦𝔢𝔫𝔠𝔢 𝔦𝔫 𝔥𝔬𝔪𝔢 𝔖𝔠𝔦𝔢𝔫𝔠𝔢

(FOOD SCIENCE AND NUTRITION**)**

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ABSTRACT

The study entitled food security in farm labour households of Kuttanad was undertaken for assessing the extent of food security and to identify the factors influencing the food security of farm labour households. From each of the seven agro ecological zones of Kuttanad, 20 farm labour households were selected randomly for the study constituting a total sample size of 140 households. A detailed study was conducted by identifying four women and four pre school children from each agro ecological zone totalling 28 each.

The food security of the selected households was ascertained by assessing the three dimensions of food security namely access, availability and utilisation of food. Food access and availability were determined by assessing socioeconomic status, food consumption pattern, food purchase inventory and food adequacy of the households. Utilisation was determined by assessing the nutritional status of family members. Overall food security was also determined using the food security module suggested by USDA.

Nuclear family system with 4 to 6 members was noticed among most of the households. Most of the adult family members were educated up to high school level and 71.89 per cent men and 54.51 per cent women were working as agricultural labourers. The monthly income of the households was found to be very low and they spent above 50 per cent of their income for the purchase of food materials. The housing and living conditions were found to be poor with no drainage and drinking water facilities.

The food consumption pattern of the households indicated that all were non vegetarians and followed a three meal a day pattern. Most frequently used food items included cereals, vegetables, fish and fats and oils. Milk and milk products, meat and egg were used to a lesser extent by the households. Food expenditure pattern of the households indicated that 67 per cent spent 10 to 35 per cent of food expenditure for the purchase of cereals and 10 to 28 per cent did not spent any money for the purchase of

milk and milk products, egg, meat and fish. Food purchase inventory of the households revealed that all items were purchased to a lesser extent compared to the actual requirement of the households. Food adequacy in terms of food intake per consumption unit indicated inadequacy of all food groups except flesh foods. The per capita intake of all nutrients was also found to be lower than the recommended levels.

The nutritional status of family members through anthropometry indicated that 25 to 48 per cent children, adolescents and elderly had different grades of malnutrition. However, the nutritional status of adult members was found to be better with 72 per cent of adults having a normal BMI of 20 to 25 kg/m^2. The actual food and nutrient intake of women and preschool children were found to be far below the RDA for most of the food groups and nutrients. Anaemia was prevalent among 90 per cent of women.

Food security status of the households indicated food insecurity among most of the households. Only 49 per cent of the households were found to be food secure on the basis of overall food security. On the basis of food access, availability and utilization, food security was observed only among 25 per cent of the households. Among the different factors affecting food security family size was found to be the most important one followed by income, food expenditure and energy intake.