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**NUTRITIONAL STATUS AND STRESS DETERMINANTS OF  
WOMEN WORKERS IN RUBBER PLANTATIONS**

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for the degree of**

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**Department of Home Science  
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## DECLARATION

*I hereby declare that this thesis entitled "Nutritional Status and stress determinants of women workers in rubber plantations" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award of any degree, diploma, associate ship, fellowship or other similar title, of any other university or society.*

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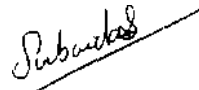


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## CERTIFICATE

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# *Introduction*

## 1. INTRODUCTION

Women constitute half of the world's population and influence the growth of the remaining half of the population. Women's nutritional and health status is both of individual and national concern, because it affects her well being and productivity at the household level and in the formal and informal sectors of the national economy as well as her children, the seeds of next generation. Now there is tremendous increase of women at workplaces. Formerly it was considered that men to heavy, risky and strenuous work whereas of muscular, skeletal disorders. In the present scenario women have also taken up risk jobs which is equal to that men do, and so now women are exposed to lots of hazards. Stress, strain and violence at work are more likely to affect women than men.

Women in developing countries are often in poor health and are overburdened with work. Women's special needs are often being ignored by health planners and women have borne a disproportionate share of unmet health needs (Hautvast, 1997).

Women's health and nutritional status is inextricably bound up with social, cultural and economic factors that influence all aspects of their lives, and it has consequences not only for the women themselves but also for the well-being of their children. Health of women is an important factor in determining the overall health of the society (Samantha, 2005).

Working mothers are reported to bear triple responsibility of rearing children, managing households and supplementing the family income. The women engaged in rubber plantations also play the same roles and they face problems at home and in their work place that might lead to stress as well as under nourishment and poor health. For women, family stress combined with work is often stated as an important factor that determines mental and physical health (Powell, 1994).

As women continue to bear the brunt of hard labour in poor countries, it is important to foster the concept of improving women's nutrition and health for the sake of women themselves, rather than just for that of their children. The nutritional status of women during adolescence could be improved considerably, with spin – off benefits of their future infants. (Barnett and Hyde, 2001)

The nutritional status of women is comprised by unequal access to food, by heavy work demands, and by special nutritional needs, females are particularly susceptible to illness particularly anaemia. Women especially poor women are often trapped in a cycle of ill health exacerbated by child bearing and hard physical labour.

Since time immemorial women in India have formed a crucial component of the work force. They participate in social production as well as production of labour for the next generation (Devdas, 1999).

The position of women in any society is an index of its civilization. They constitute 50 per cent of the population, that is one half of the world's food supply; account for 60 per cent of the working force ; contribute up to 30 percent of the total labour force; receive only 10 per cent of the world economy and own less than one per cent of the world's property (Rajalekshmi and Gayathri,2001). Women must be recognized as a power in development and should be involved more actively and productively in all the developmental process.

According to Samantha (2005) rural women contribute 72.72 percent of the total female population of the country. It was pointed out that women still do two third of the work, but receive daily one tenth of world's income and own less than one hundredth of its property.

Women's activities are primarily connected to home and family; they have been in the labour front from time immemorial. In the initial periods



women of lower economic and social strata were equal participants in the labour scenario. In recent decades more and more women are coming out of their household, tie-ups with respect to employment to become economically independent and socially more acceptable. Several factors are directly and indirectly contributed to this change, particularly in a progressive state like Kerala .The monotony of rural life may motivate the women to take up employment which offers her opportunities for socialization.

Income earned by women forms a visible portion of the family income, which determines the economic power that a family enjoys. By working in the vicinity of the home itself, and taking care of the household, she enables herself to earn a living. Then the incomes earned by the women are utilized profitably to enrich the family resources.

An important observation by Chatterji (1993) has indicated that, traditional, cultural moves have seem to it that men remain at the receiving end of best quality and quantity of food. This situation worsens when become primarily responsible for 37.64 per cent of Indian households and are being increasingly burdened with the growing responsibility of fulfilling the basic survival needs of all the families. (Agarwal, 1993)

According to the primary census abstract (2001) 14.78 per cent of women in Kerala are in household manufacturing industries. It has been further stated that, Kerala has a high concentration of women labour in the factory sector (50. 74 per cent), which is the highest in the country. According to Chatterji (1993) outside employment taken up by the women generally resulted in negligence of their own health and has led to various nutritional problems. For women family stress combined with work, is often stated as an important factor that determines mental and physical health (Powell, 1994).

Leonard and Brunal (1995) have considered stress as body's normal response to stimuli or anything that disturbs its natural, physical, emotional

or mental balance. Studies have shown that women experience higher job stress and are more likely to bring job stress home. Eapen *et al.* (2000) revealed that women generally have more responsibilities at home than men do.

Under the present scenario it is essential to understand the nutritional status of the women workers especially involved in the rubber plantation because Kerala is the one of the highest rubber planted sectors in the country. Large numbers of women are employed in the rubber plantations under several modes of occupation.

There is high incidence of malnutrition and low health status among the vulnerable sectors of the population in the third world countries. This problem acquires crucial significance, where the health status of women is involved, since the well being of future generation depend heavily on the pregnant and lactating women.

An in- depth study on the influence of work outside their homes on the food habits and nutritional status of women workers of rubber plantation is still an uncovered area. The present investigation attempts to assess the nutritional status and stress determinants of the women workers of rubber plantation. Stress is very much related to health status hence the study also investigates the relationship of nutritional status and stress if any.

# *Review of Literature*

## **2. REVIEW OF LITERATURE**

The present investigation is carried out with a view to understand the nutritional status of the women workers and to probe into the factors influencing the nutritional status. It also aims to find the stress determinants leading to the nutritional status and relationship with it. A brief review of the related literature is attempted here. The review is classified under the following different sections.

### **2.1 Women Workers**

- 2.1.1 Women work force in India
- 2.1.2 General health status of working women
- 2.1.3 Problems of working women

### **2.2 Nutritional Status**

- 2.2.1 Nutritional Status of Women
- 2.2.2 Nutritional status of working women
- 2.2.3 Factors influencing the nutritional status of women

### **2.3 Stress Determinants**

- 2.3.1 Factors influencing stress
- 2.3.2 Psychosocial work stress in woman
- 2.3.3 Women in work environment

### **2.4 Relationship between stress and nutritional status**

#### **2.1 WOMEN WORKERS**

##### **2.1.1 Women Work Force in India**

A workingwoman refers to a woman who works outside her home for a wage or profit (Devdas 1996).

Workingwomen are those women who are earning full or part of their livelihood by engaging themselves in any occupation or work for pay or profit (Swarajyalaxmi, 1992)

In India, for example, official statistics suggest that 14% of the female population is working, compared with 52% of men. A special commission in 1988, however, found that more than 90% of working women in India were in the informal sector and unlikely to be recorded by the census-takers surveying the country's economy (Charyulu and Narayana,1997).

A study by ILO that detailed the way rural women spent their time indicated that up to 90% of rural women in central India participated in agriculture (International Labour Organization, 1992).

Census 2001 reports that 23 percent of women in India are in work force, 94 percent of all workingwomen are in the informal sector.

In urban India, the female work participation rates of all workers, main and marginal, increased from 8.31% (1981) to 9.19% (1991). In comparison the male work participation rate declined from 49.06% (1981) to 48.95% (1991). Although an increase in female work participation rates took place in the 1980s it is evident that of the urban female workers, self-employed or casual workers amounted to nearly 73%. Thus three quarters of the urban female workers were working in an insecure position in terms of a regular source of income (Government of India Census, 2001).

### **2.1.2 General Health Status of Working Women**

In a study, it is showed that the differences in men's and women's lifestyles and roles, which place women at greater, risk of nutritional deficiency than men. Where the social status of women and girls is low, their access to food and medical treatment is restricted, resulting in lower health status (Sayer *et al.*, 1996).

As women continue to bear the brunt of the hard labour in poor countries, it is important to foster the concept of improving women's nutrition and health for

the sake of women themselves, rather than just for that of their children. The nutritional status of women during adolescence could be improved considerably, with spin-off benefits for their future infants (Barnett and Hyde, 2001).

### **2.1.2.1 Health and Nutritional Status**

(Health is one of the important indicators for assessing the status of women in any society.) The state of an Indian woman's health is intrinsically related to her socio-economic status and affects all aspects of her life. The circumstances in which many women live place little or no importance on personal hygiene (Government of India Census, 2001).

Nutrition plays an important role in physical, mental and emotional development of human being (Government of India Census, 2001). Health is not a static phenomenon but a dynamic life process, which begins at birth and is governed by genetic, nutritional and environmental factors throughout life (Thilakavathi and Purushothaman, 2001).

Women in developing countries are often in poor health and are overburdened with work. Women's special needs are often being ignored by health planners and women have borne a disproportionate share of unmet health needs (Hautvast, 1997).

In a study of physically active women in US army, only women participating in the job categories defined as heavily physical are in increased risk of preterm birth (Remirez *et al.*, 2002). For women, family stress combined with work, is often stated as an important factor that determines mental and physical health (Powell, 1994).

The importance of women's domestic and food production responsibilities has often been neglected by planners and policy makers in the development process in rural Africa. In the subsistence sector, this has marginalized women by reducing their productivity and control over resources and shutting them out of development processes, while concurrently increasing their workload. These factors, combined with

mechanization and the increased importance of a cash economy, have serious implications for women's health and nutrition (Lado, 1992). Razeena (2000) who conducted a study on the women working in a sewage farm in Thiruvananthapuram revealed that 35 per cent of them suffered from infectious diseases and skin diseases.

The highly deficient diet consumed by women workers adversely affects their health and work capacity. Women with poor nutritional and health status cannot endure long hours of physical activity (Barnett and Brennan, 1998).

Workplace hazards can affect a woman's reproductive health too. Her ability to become pregnant or the health of her unborn children (National Institute of Occupational Safety and Health, 1999).

A key factor in the development of disease and risk of poor nutrition is stress, both physiological and psychological. This basic risk factor parameters human life with positive and negative effects (Williams and Nesse, 1994).

### **2.1.3 Problems of Working Women**

The highest motivation for majority of Indian women to work is indeed the sheer economic necessity (Williams and Nesse, 1994).

Women farm workers are generally the double victim of class wise exploitation and gender based discrimination and they generally agree to work at very low wages to sheer subsistence (Dogra, 2002).

Clarkson (2001) found that in most developing countries, the demands of work both inside and outside the household lead women to spend nearly all of their waking hours working .In rural India and parts of East Africa, a woman's workday lasts for an average of about 16 hours.

According to Jagadambal and Nalinadevi (2000) the major problems faced by women workers due to heavy and never ending work,

constant exposure to sunlight, insecticides, pesticides and working in unhygienic conditions causes body pain, head ache, chest pain, respiratory infections, eye problems, skin allergy etc.

A study by Ukkuru (2002) revealed that employed women despite their dual burden of work were found to enjoy better health status than their unemployed counter parts. Further the employed women were found to have several difficulties like inability to find time for childcare and cope to with household and job responsibilities, lack of leisure time and inadequate rest. Mittal (1996) stated that heavy workload has a direct effect of causing loss of energy leading to body weakness under conditions of poor food supply.

## 2.2 NUTRITIONAL STATUS

Kamath (1986) defined nutritional status as the state of health enjoyed as a result of nutrition.

Nutritional status is one of the critical indicators of health and therefore is important to maintain the health (Mourya and Jaya, 1997).

Nutritional status is one of the indicators of both the level of development and the development potential of a given country. In many developing countries nutritional status is linked to the availability of food, often related directly to food production in a given year. It is also an indicator of the type of food available to people, the traditions or habits that have developed over time and the level of poverty in a given society (Policy Research Institute, 1992). Nutritional status of the population is critical to the development and wellbeing of the nation (Rao, 1999).

### 2.2.1 Nutritional Status of Women

Malnutrition affects activity, growth, health, learning capacity, work performance and overall quality of life (Prabhakar, 2003, Kumari and Singh, 2003).



Malnutrition adversely affects women's participation in the economic system and their productivity. To break this vicious downward spiral, it is important to focus simultaneously on women's nutrition-related roles and their nutritional status (Chatterjee, 1993).

In a study it was shown that nutritional equity is lower in northern India and improves toward the south. While in Rajasthan, a northern state, all children under 12 years old and adult women were deprived of their fair nutritional shares relative to adult males, as well as to the applicable RDAs, the gender differential disappeared among adults in the western states of Gujarat for and Maharashtra, and the southern states of Andhra Pradesh and Tamil Nadu (Neill, 1994).

The deprivation of women appears to be economically rather than culturally mediated, as work plays a significant role in female undernutrition. The social and economic value of women underlies regional variations in their nutrition status and in sex-based differences in nutrition. Some evidence exists that while women get a disproportionately small share of household food, they may expend a larger proportion of household energy (Batilwala, 1992).

### **2.2.2 Nutritional Status of Working Women**

It illustrates the interrelationship of nutrition, workload, and health in the context of women's energy expenditure on agricultural and domestic chores. As the problems of poor rural women have common roots in many countries and regions, issues have been selected for their broad applicability and should not be interpreted as isolated phenomena of the particular community studied.

Employed women from economically poorer segments of population in the village with lower purchasing power and lower dietary intake had deficient dietary intake (Prema, 1996).

Physically demanding work performed by women had significantly negative effect on nutritional status (Paul and Harold, 1993) Delange (1994) found that poor nutritional status leads to poor nutritional attainment and decreased economic productivity.

The hard labour performed by the women both within and outside home, may lead to a situation chronic deficit calorie intake vis-à-vis their expenditure (Health profile of women South East Asia, 1996).

A study conducted among the farm women labours of Bangalore observed poor nutritional status and deficit intake of all foods among them (Swamy *et al.*, 2000).

A study by Lal and Sood (1992) on workload and pattern of 300 rural women to different economic strata was undertaken. They found that the women had a heavy workload from 14 to 17 hours a day and this sapped their energies and led to poor nutritional status.

### **2.2.3 Factors Influencing the Nutritional Status of Women**

There are several important reasons why women's health and nutrition should be considered part of an intergenerational continuum. Throughout the life cycle, female nutrition is affected by complex interactions among the following types of factors:

Social, economic, and cultural factors that include social status, female discrimination, and fertility patterns that influence both exposure to and consequences of disease:

Individual behavior and psychological factors, including dietary practices, reproductive patterns, health-seeking behavior, and use of health and nutrition services: Biological factors (age of menarche, menstruation, pregnancy, and increased risk of infections (Walker, 1997). Gawan *et al.* (1994) found that capital and wage variables have significant impact on the household nutrient demands and they also found that income, wage and educational status have very different effects on the nutrient choices of high calorie households. The health and nutritional status of women is important for both the quality of their lives and the survival and healthy development of their children.

According to Srinath (1998) nutritional status is an indicator of socio-economic well being of a community. Socio-economic and demographic

factors play an important role also on the pattern of consumption of food and nutrition (Rahman and Rao, 2002).

The poverty and poor food intake by the families were reflected in the socio-economic characters and low nutritional status of the women coir workers though they were wage earners (Lovely, 1996).

Socio economic status is known to be key determinant of health status of any individual as it affects educational background, food consumption pattern and other life style behaviour factors (Cheng, 2003).

A study done by Arora (1991) revealed that socio economic level of respondents such as social, economic, religious and family background in general have a very distinctive part to play in determining the attitude and food behaviour pattern of the individual.

Socio-economic and socio-cultural factors (e.g., income, literacy, traditional beliefs) simultaneously influence both women's nutrition status and their nutrition-related roles (Chatterjee, 1993 and Lambert, 1996).

Women's nutrition and health status are affected by (macro and micro) socio-economic and socio-cultural factors. Access implies both the physical availability of services and social and economic conditions that permit and enable women to use health services (Miller, 1991 and Schulta, 1992).

### 2.3 STRESS DETERMINANTS

Stress can simply be defined as our reaction to our external environment, as well as our internal thoughts and feelings (Gomez, 2003).

Stress can be defined as a physical or psychological stimulus, which produces strain or disruption of the individual's normal psychological equilibrium (Arthur, 2002).

Stress is body's normal response to stimuli or anything that disturbs its natural, physical, emotional or mental balance (Leonard and Brunal, 1995).

Themes and Variations (2002) define stress as any circumstances that threaten one's well being and that there by loose ones coping ability.

Stress is the condition that results from a person's response to physical, emotional or environmental factors. It can be referred to physical effort as well as mental tension and is arousal with the body responds to different demands (Shealy, 1999).

### **2.3.1 Factors Influencing Stress**

Stress is widespread throughout the workplace, with many citing poor management style and excessive workloads as significant factors. Critically for organizations, 30% of those who have experienced significant levels of stress feel that it has lessened their commitment to their employers. Stress was also cited as having a negative effect on the health of over a third of the working population (amounting to approximately 8.5 million people), with men and women being equally affected by the problem (International Stress Management Association [UK] (ISMA) 1999).

Studies have shown that women experience higher job stress and are more likely to bring job stress to home. Empirical studies have indicated that global stress perceived by women at work place include psychological, physical work demands, job control, anticipation of job loss, assessment of work associates, fear of abuse, family functions and stressful life events. It is difficult for working women to manage and balance their responsibilities (Vimala *et al.*, 2004)

More than half of the employed women were found to suffer from employment related strain at medium to high level (Ukkuru, 2002).

Family related stress on work related stress is greater for females than for men (Narayanan *et al.*, 1999).

Job stress is a chronic disease caused by conditions in the workplace that negatively affects an individual's performance and/or overall well being of his/her body and mind (Ellis, 2002) Sharma (2000) stated that job stress is associated

with back pain, coronary heart diseases, and immune disorders, personal and family problems. He found that a combination of high demands and lack of control and support, contributes to absenteeism, mental strain, muscles and bone problems including repetitive strain injuries.

Study conducted by Bhan (2002) among female physicians found that 31 percent respondents might not choose the same carrier path again because of high work stress, history of harassment, increased family responsibilities and lack of job autonomy

Another study conducted on 105 working women (lecturers, factory working, and nurses) and 75 housewives found differences in life stress. The study revealed that workingwomen were in more stressful conditions than the housewives. (Naik ,2000 and Breilh ,1994) presented survey results with regard to stress among women in the civil service in Ecuador. A high proportion of the women surveyed were in a state of stress. He reported that high stress levels among female civil servants were associated with repetitive and dull work, poor organization, and too much work. It was also shown that women who stood a great deal during their work were most affected by stress.

Many job conditions contribute to stress among women. Such job conditions Include heavy workload demands; little control over work; role ambiguity and conflict; job insecurity; poor relationships with coworkers and supervisors; and work that is narrow, repetitive, and monotonous. Other factors, such as sexual harassment and work and family balance issues, may also be stressors for women in the workplace (Shealy, 1995).

The interactions between the type of organizations and the type of workers as well as between the organization and intervention techniques also have a significant effect on stress (Millia *et al.*, 2003).

Stress and job satisfaction were related to attitudes toward health care. Women who experienced high stress and low satisfaction were more likely to have negative views of the functioning of the health care system. In addition,

demographic and practice variables contributed to negative attitudes (Richardson and Burke, 1993)

### **2.3.2 Psychosocial Work Stress in Woman**

#### **2.3.2.1 Work Load**

Several studies have shown that heavy workload has a negative influence on the nutritional status of women.

A few studies suggest that women work longer hours and spend more energy than men. Women had a shortfall of 100 calories a day on an average if their physical activity in paid and unpaid domestic work was considered all together, while men had a surplus of 800 calories (in 560 households in six Karnataka villages) (Batilwala, 1992). Rathore (1993) found that women from various unorganized sectors, such as agriculture, construction and domestic work had working hours that ranged from 8-9 hours, 5-7 hours and 2-5 hours respectively Rani and Rajaiah (1998) have reported that female work participation rate is high for low paid work.

Work load could be the principle of health and well being among all the potential sources of stressors related to nursing, workload and remuneration were the most important stressors for nurses (Purvi *et al.* 2004).

Employed women experience a multitude of work related stressors, yet they appear to be better off than women who are not employed. Although multiple roles for women produce a number of benefits, certain work conditions are deteriorious to woman's well being (Repetti *et al.*, 1990).

Houstan *et al.* (1992) observed that more quantitative overload was associated with more tension and health problems in women.

According to Lukmanji (1992) the interaction between women's workload and health is complex and multi-factorial owing to variations in the environment and socio-economic conditions.

Results showed that women dedicated 46.2% of their time (11.1 hours per day) to economically productive work activity, compared with an average for men of 33.9% (8.1 hours per day). Including housework, women spent on average 77.6 hours working per week, compared to 57 hours per week for men (Edmundson and Edmundson, 1998).

Women subject to violence within the home, in society, through dowry deaths and rape, are left not only physically destroyed for life but with severe psychological damage (Government of India Census 2001). Throughout the world, women work long and difficult hours in the formal and informal sectors, as well as in the household. However, in both industrialized and developing countries, the health implications of women's work are an area of study that has been relatively neglected (Messing, 1991; Berr, 1994; Haile, 1994).

Factory employees working at piecework rates, or paid by the hour, are subject to extreme time pressures, which may result in anxiety and stress. (Messing, 1991).

Studies in Tanzania have shown that most women continue to carry out energy-consuming work, such as fetching firewood and fuel, farming, cooking and washing, and taking care of children, until their last days of pregnancy and that they often do so without adequate caloric intake (Mpanju, 1992).

The double shift and double load of working both inside and outside the home creates considerable physical and mental stress (Berr, 1994), and the roles commonly conflict. Household duties do not begin and end at set times. Rather, they dominate, in one-way or another, the entire day. While working, women invariably are thinking of their home and making decisions that affect the household and their children.

When all forms of women's work are considered, women in the developing world work longer hours per day than men (Jacobson 1993; Paolisso and Leslie, 1995). Although there are differences from region to region, estimates vary from 16 to 20 hours per day in some areas (Acevado and Handali, 1994).

Women in India, especially in agricultural areas, are expected to perform a variety of strenuous tasks within the household, on family lands, and, in some regions, for wages. These occupations often have serious consequences for undernourished females, including adolescents, whose bone structure is not yet fully developed and who may be required to carry heavy loads or to adopt unnatural postures for prolonged periods (Feroza *et al.*, 2002).

#### **2.3.2.2 Dual Responsibility**

Dual responsibilities are likely to add significant load on woman's physical, mental health and the load itself might be an additional source of work related stress (Remnick, 2002)

Study done by Lovely (1996) among 200 respondents in coir industries found that, the women who were engaged in the industry play a dual role of housewife as well as a wage earner and hence they are subjected to great stress and strain.

Women's heavier responsibilities, and the difficulties they experience in carrying them out, lead to conflict between their various roles and reduce their limited leisure time (Lado, 1992).

#### **2.3.2.3 Personal and Family Problems**

Women are primary victims of safety negligence at work. Although invisible in official statistics on work related accidents and illnesses, women are more likely to victims of poor safety standards at work (Brussels, 2002).



Poor conditions in the household may negatively affect a woman's work in the formal sphere. Fatigue may lead to higher rates of absenteeism and to frustration and discontent, which may cause high rates of turnover (International Labour Organization, 1994). Being overburdened by numerous responsibilities may cause cumulative detrimental health effects such as fatigue, stress, and diminished resistance to disease and chronic illness. The significant demands may lead to the deprivation of physiological necessities, such as sleep. Furthermore, "[a] body tired out from taking care of a baby or ill parent may be less able to resist a virus ... or to protect itself against the solvents in cleaning solutions" (Messing, 1991).

### **2.3.3 Women in Work Environment**

A survey of workplace union reported that stress, strain and violence at work are more likely to affect women than men (International Labour Organization, 2004).

According to a new report workingwomen, in the new technology make their lives more hectic. As a result, a growing number of career women are suffering from 'frantic life syndrome' (Trades Union Congress, 2004).

Health problems affect all people in marginal areas; poor environmental conditions have a disproportionately negative effect on women's health (Ferguson, 1996).

The nature of the relationships at work and the problems associated with the interface between the organization and the outside world, e.g., work versus family (Cooper, 1995).

According to a World Health Organization report, 'About 50% of the entire working population are unhappy in their jobs and as many as 90% may be spending much of their time and energy in work that brings them no closer to their goals in life. About 75% of those who consult psychiatrists are experiencing problems that can be traced to a lack of job satisfaction (Levi, 1990).

## 2.4 RELATIONSHIP BETWEEN STRESS AND NUTRITION

Stressful life situations often result in unhealthy behaviors, normally under control, to resurface. Diet is one such area of behavior that tends to be abused or neglected under stress. Balanced nutrition, however, is necessary for overall health, and affects your ability to cope with stress. A healthy body is always able to better respond to the tensions of daily life, and good nutrition is a major contributing factor to good health (Gomez, 2003).

Stress often increases cravings for high fat snacks or comfort foods. Small treats that have less fat and sugar that will satiate the craving without adding excessive fat and calories (Gomez, 2003).

In a study Stoney (1997) find that stress increases blood cholesterol levels and also found that stress can reduce plasma triglyceride clearance in healthy men and women.

Women at rest are more efficient at clearing fat in the body, when women are stressed; they are not more efficient at clearing fat than men. (Stoney, 1997) Fava and Mischoulon (2000) suggests that when people are worn out from the stress of trying to do too much, they often turn to sugar, caffeine, or vitamins to increase energy levels and help them function.

Eck and Wilson (2004) in their studies had shown that the body depletes its stores of nutrients when under stress, mainly protein and the B vitamins as well as vitamins C and A. A deficiency of magnesium, which helps muscles relax, has been linked to high-stress personalities. Under prolonged stress or are at risk for hypertension, one should consume foods high in potassium, such as orange juice, squash, potatoes, apricots, limes, bananas, avocados, tomatoes, and peaches.

A study by Nancy (2002) found that those who are stressed and consume something fattening take about 20% longer to clear the heart-damaging fats from the bloodstream than those who are not stressed.

Nutritional stress on women is the outcome of low dietary intake on account of Economic and social backwardness and their high energy output for work and child-bearing (Chatterjee, 1993).

On the Indian subcontinent' female nutritional stress begins in childhood and continues through adolescence into adulthood (Nutrition Society of India, 1985).

Biochemical role of nutrition on emotional health offers hope for relief of emotional distress because mental energy is very much dependent upon a healthy blood glucose level which is the only fuel used in appreciable quantities by the brain (Feroza and Memn, 1999).

As the blood glucose level falls, the cortex and other brain areas with high metabolic rates are affected first, resulting in cortical symptoms of confusion, weakness and dizziness (Arthur and John, 2002). Feroza (2001) reported that glucose is indispensable for the maintenance of functional integrity of nerve tissue and under normal conditions, is the sole source of energy for the brain, since a rapid decrease in glucose may produce hunger and increase the excessive release of epinephrine, which causes stress.

Study by Hobel and Siega-Riz (1998) suggest that improving nutritional status may be a plausible intervention for reducing Stress and weight gain preterm birth.

The use of dietary energy was less efficient in women under stress. At that time stress was well known to cause an increased secretion of corticoids, catecholamine, growth hormone and prolactin; now these hormones are known to impair insulin release, stimulate glycogenolysis and lipolysis and increase metabolic rate. These data were the first to suggest that stress-induced metabolic changes may explain the impaired conversion of dietary calories to maternal weight gain (Memon *et al.*, 1997).

Osmond (1996) found that poor nutrition was emerged as a very important component of the stress syndrome and that needs further characterization in the pathways for the risk of infection.

In depression (which is a stress condition), a positive correlation between serum zinc and cofactor for synthesis of (n-3) fatty acids (Maes *et al.*, 1999).

In a study of 'Micronutrient deficiency and stress' revealed that, there is growing evidence that deficiency in (n-3) fatty acid is associated with depression, an important component of stress syndrome (Fava and Mischoulon, 2000).

It has also been found that fatty acids deficiency in (n-3) fatty acids may affect the central nervous system during early development and lead to increased vulnerability to depression (Jamieson *et al.*, 1995).

According to Eck and Wilson (2004) the body depletes its stores of nutrients when under stress, mainly protein, and vitamins A, B and C .A deficiency of magnesium (which helps muscle relaxation) has been linked to "Type A" or high stress personalities

Yerwarker (2000) found that sicknesses like osteoporosis, back aches, depression, hyper acidity, anaemia and urinary infections can be fall-outs for women who ignore their diets.

The result of biochemical tests of a study aimed to investigate the correlation of stress and blood glucose level of workingwomen and non-workingwomen showed that blood sugar level was low in non-working women as compared to working women. After calculation of stresses, it has been observed that the level of stress in non-working women were significantly higher as compared to workingwomen (Feroza., 2001).

Watson (1995) discovered that certain foods and nutrients are specifically required for the different oxidation types, this was the beginning of the development of specific nutritional therapy related to an individual's current stage of stress, a revolutionary nutritional concept.

In a study compared energy stress in three groups of rural women from India, Benin, and Ethiopia, paying particular attention to their weight loss and metabolic changes during the "hungry" season. The results highlight the diverse combination of mechanisms elicited by exposure to seasonal energy deficits: both the body weight and the Basal Metabolic Rate (BMR) of the Ethiopian women dropped, whereas the Beninese women mobilized only their body energy stores and the Indian women only their BMR. This diversity of response is thought to be linked to the varying nutritional status of the three groups of women. While the Beninese women had a normal body mass index (BMI), both the Indian and Ethiopian women's BMI was lower and many would be classifiable as Chronic Energy Deficient. Weight loss in high BMI persons involves loss of body fat, whereas losses in low BMI persons entail increasingly large proportions of fat-free mass (lean tissue) as the proportion of body fat decreases. The finding that the energy deficit was almost completely accounted for by combinations of weight loss and changes in BMR raises questions about the role of physical activity (Ferro-Luzzi, 1990).

Diet is one area of behavior that tends to be abused or neglected under stress, and affects our ability to cope with stress. A healthy body is always able to better respond to the tensions of daily life, and good nutrition is a major contributing factor to health (Gomez, 2003).

Balanced nutrition is essential to maintaining overall good health, but it also can affect the capacity to cope with stress. Going through a period of stress, one need more of all nutrients, particularly the B vitamins, which affect the nervous system, and calcium, which is needed to counteract the lactic acid tense muscles produce. Likewise, if lacking nutrients, the body will not be equipped to handle stress effectively (Paul, 1995).

A well balanced diet is crucial in preserving health and helping to reduce stress. Certain foods and drinks act as powerful stimulants to the body and hence are a direct cause of stress. This stimulation, although quite pleasurable in the short term, may be quite harmful in the long run (Naik, 2000).

# *Methodology*

### 3. MATERIALS AND METHODS

The methodology adopted for the study entitled “Nutritional Status and stress determinants of women workers in rubber plantations” is presented in this chapter.

The major objective of the study is to assess the nutritional status and stress among women workers in rubber plantation and to find out the relationship between stress and nutritional status.

#### 3.1 CONDUCT OF THE STUDY

##### 3.1.1 Locale of the Study

Pathanamthitta district was purposively selected for the study, since there are large rubber plantations in government and private sectors. Besides, according to the report of Economics Division of Rubber Research Institute of India (2003), 36 per cent of women labours in Pathanamthitta are rubber plantation workers. Kodumon panchayat was selected at random from this district for the conduct of the study. Kodumon Group of Estates was selected for the study which is under the Plantation Corporation of Kerala.

##### 3.1.1 Selection of Subjects

Two categories of subjects were selected for the study.

**Experimental Group:** Eighty women who were engaged in rubber plantation work along with house hold activities formed the experimental group.

**Control Group:** A group of twenty women who are solely engaged in household activities have similar background except for the work formed the control group.

The list of women workers in the rubber plantation was collected from Kodumon Rubber Plantation and they were arranged serially. From this list eighty women in the age group 25- 55 were purposively selected.

### **Variables and their measurements**

Socio-economic status, personal characteristics and work pattern, dietary habits, stress, health are the independent variables.

To measure the variables, plan of action comprises of the socio-economic survey, dietary survey, nutrition survey and women's stress

#### **Socio- economic survey (n =100)**

The survey to elicit information on the following dimensions of the women workers

1. Personal profile of the workers
2. Family composition
3. Economic status of the respondents
4. Family expenditure patterns
5. Household activities of the respondents
6. Health status of the respondents
7. Occupational hazards
8. Time utilization pattern.

#### **Dietary Survey**

A dietary survey was taken up for the assessment of

1. Food expenditure pattern
2. Food use frequency
3. Food consumption pattern
4. Energy expenditure pattern
5. Energy balance

#### **Women's Stress**

1. Environmental stress
2. Personal stress
3. Social stress
4. Job stress



## **Nutrition Survey**

Nutrition survey was conducted to ascertain

1. The actual food intake through 24 hours recall method
2. Anthropometric measurement
3. Clinical assessment
4. Bio chemical investigation
5. Development of N S I

## **Tools selected for the data collection**

### **1. Questionnaire for socio- economic survey**

An oral questionnaire was framed for the survey. The schedule was pre-tested on 10 women and finalized schedule was used for the main study (Appendix-1). Interview method was used for data collection.

### **2. Dietary Survey schedule**

A structured schedule was devised, pre-tested found to be reliable was used in the main study (Appendix-II).

### **3. Nutrition survey**

#### **3.1. Actual food intake**

Schedule used to record the actual intake is presented in Appendix -III. Quantity of each food item was compared with quantity specified for a balanced diet as suggested by ICMR (1991).

#### **3.2. Anthropometric measurement**

Weights and Heights were measured using standard techniques suggested by Gorstein et al (1994)

#### **3.3. Clinical Examination**

Clinical examination was conducted by a medical practitioner using the schedule presented in Appendix-IV.

### 3. 4. Bio chemical investigation

Haemoglobin estimation was conducted by Cyanmethaemoglobin method and the details are presented in Appendix V.

### 3.5. Nutritional status index

Suppose  $X_{ij}$  be observation corresponding to the  $j^{\text{th}}$  variable for the  $i^{\text{th}}$  sample,  $w_j = 1/\sigma_j^2$ , the weight assigned to the observations corresponding to the  $j^{\text{th}}$  variable, the numbered status of the  $i^{\text{th}}$

$$N_i = \sum_{j=1}^k w_j X_{ij}$$

$$i = 1, 2, 3, \dots, n$$

N ---- Number of respondents

k----- Number of variables

The NSI of the selected respondents were defined its terms of characters such as BMI, Hb level, WHR, Energy intake (Appendix VI).

### Women's Stress

Norman Shealy's stress scale was modified and used to ascertain women's stress, and the details are presented in Appendix- VII.

## ASSESSMENT OF DEPENDENT VARIABLES

The dependent variables identified for the study included nutritional status of the sample collected through anthropometric, biochemical, clinical and dietary assessment.

### Assessment of nutritional status of the subjects

#### 1) Dietary survey

Diet survey constitutes the information existing food use frequency, food preference, food expenditure pattern, food consumption

pattern, and the energy intake levels. Studies that relate to the food and nutritional status are essential for monitoring the dietary status.

Hence structured oral questionnaire, which was pre tested in the pilot study and modified suitably to collect the information from the subjects were used. Details pertaining to the food use frequency of various items, food use frequency and food preferences and habits of taking food from outside the home were also assessed.

### **1. 1. Energy Balance**

Low energy expenditure will increase the probability of being in positive energy balance for a given energy intake (Poehlman and Horton, 1990). So to find out the energy balance, the energy intake, requirement and expenditure of subjects were measured.

In order to determine the energy balance, the energy expenditure and energy intake pattern of the respondents were determined. Energy expenditure was determined using prediction equation as suggested by ICMR (1989) given in (Appendix IX).

### **1.2. Energy expenditure patterns**

Women were questioned to find the items of activities, they were engaged in all through out the day and the duration for which they were engaged in these activities in a day randomly chosen. Care was taken to see that it is a usual day for her. Energy expended for each activity was calculated using the schedule for energy expenditure of selected activities (Swaminathan, 1986).

For assessing the energy expenditure daily work schedule of the subjects were recorded. Basal Metabolic Rate (BMR) was computed from the body weight., based on the factorial method provided by FAO/WHO/UNO/ Expert Consultation (1985).Employing the factorial approach and the computed BMR from body weights and the recommended BMR factors for Indians, for different levels of physical

activity, the energy expenditure of the subjects were computed as suggested by ICMR (1992) (Appendix IX).

## **2. Nutrition Survey**

### **2.1. Actual food intake (24Hour Recall Method)**

In the dietary recall method the respondents were asked to recall the actual food consumed by them in the previous day. In this recall method of oral questionnaire diet survey, a set of 'standardized cups', suited to local conditions were used. The housewife or the member of the household who invariably cooks and serves food to the family members was asked about the types of food preparation made at breakfast, lunch, afternoon tea time and dinner. An account of the raw ingredients used for each of the preparations was obtained. Information on the total cooked amount of each preparation was noted in terms of standardized cups. Using the cups assessed the intake of each food preparation by the specific individual in the family. The cups were used mainly to aid the respondent recall the quantities prepared and fed to the individual members.

Individual intake in terms of raw equivalents (g) =

$$\frac{\text{Total amount of each ingredient (g)}}{\text{Total cooked amount (g)}} \times \text{Individual intake of cooked amount (g)}$$

### **2.2. Anthropometric measurement**

Nutritional anthropometry is measurement of human body at various ages and level of nutritional status.

Anthropometry has been accepted as one of the important tools for the assessment of nutritional status of a population and to monitor the growth and health of individual (Gorstein *et. al.*, 1994).

Therefore height, weight, mid upper arm circumferences, waist and hip ratio of the subjects were measured and recorded using the standardized techniques

Weight is a measurement of body mass. According to Kaul and Nyamongo (1990) a change in body weight may be the result of changes in the health of an individual, changes in dietary supplies or even change in one's physical activity.

Weighing balance was used for taking weight, as it is portable and convenient to use in the field. The weighing scale was checked periodically for accuracy. The scale was adjusted to zero before each measurement. The respondent was asked to stand on the platform of the scale without touching anything and looking straight ahead. Care was taken to place the balance on a flat surface. Each reading was taken twice to ensure correctness of the measurement.

The height of an individual is made of sum of four components legs, pelvis, syvine and skull (Gopaldas and Seshadri, 1987)

Height was measured using stature meter, which was fixed vertically on a smooth wall, perpendicular to the ground, taking care to see that the floor area was even and not rough. The subjects were asked to remove their slippers and to stand with the centre of the back touching the wall, with feet parallel and heels, buttocks, shoulder and back of head touching the wall. The head was held comfortably erect, the arms hanging loosely by the side. By stretching the meter the height of the subject was measured.

Waist Hip Ratio gives distribution of fat in the human body. A waist Hip Ratio greater than 1.0 in men and 0.8 in women is indicative of android obesity and increases the risk of atherosclerosis (Srilakshmi, 2003) (Appendix X).

Measurement of mid upper arm circumference is the most useful, practical method for assessing muscle mass, as this region is easily accessible and measurement requires only a flexible fiber glass tape (Gopaldas and Sheshadri, 1987).

Mid upper arm circumference of the respondents were measured to the nearest 0.1 cm with a tape placing gently but firmly round the limb to

avoid compression of the soft tissues. The mid point of the left arm while in hanging pose is taken (Appendix X).

Body mass index is expressed as the ratio of weight to height square [weight (kg)/height<sup>2</sup> (m)]. This is used as a good parameter to grade chronic energy deficiency. BMI is regarded as a good indicator of nutritional status. The BMI has good correlation with fatness. It may also be used as an indicator of health risk. Based on BMI, respondents were classified into the following grade.

BMI is also classified as under weight (<16.00 kg m<sup>-2</sup>), normal (20.00 – 25.00 kg m<sup>-2</sup>), over weight (25.00 – 30.00 kg m<sup>-2</sup>) and obesity (30 above) (Appendix X).

### **2. 3.Clinical Examination**

Clinical examination is stated to be one of the most essential and simplest tool used in the evaluation of nutritional status. It is a part of nutritional assessment through which direct information of signs and symptoms of dietary deficiency prevalent. The presence or absence of clinical deficiency symptoms, which is an index of nutritional status, was assessed here by a qualified physician using a Performa by NIN (1986). The incidence of the clinical signs and symptoms prevalent were then tabulated.

### **2. 4. Biochemical Assessment**

#### **Haemoglobin Estimation**

Haemoglobin level is a useful index of the overall state of nutrition irrespective of its significance in anaemia. Biochemical investigation of haemoglobin is one of the most important tools for assessing the nutritional status of the subject. The haemoglobin level of the subjects estimated through 'Cyanmethaemoglobin' method.

### **Time Utilization Pattern**

In order to assess the life style and workload of the women workers and its relation to their nutritional status, the time utilization pattern of the respondents were studied (Appendix XI).

The energy requirement of an individual is the level of energy intake from food, that will balance energy expenditure, when the individual has a body size and composition and level of physical activity, consistent with long term good health and that will allow for maintenance economically necessary and socially desirable activity (ICMR 1992) It is also recommended that energy requirement must be assessed in terms of energy expenditure rather than in terms of energy intake. The energy requirement for a moderately active individual was taken as 2225Kcal/day as per the standards suggested by ICMR for moderately active Indian reference women and the energy requirement for sedentary active women was taken as 1875Kcal/day. Time spent for daily activity was assessed using questionnaire by interview method Time spent for different activities including household and occupational per day was recorded.

### **2.5. Nutritional Status Index**

The NSI of the selected respondents were defined in terms of variables such as BMI, haemoglobin, nutrient intake and WHR

### **Women's Stress**

Stress can often lead a person to change their dietary habits. There are some stress induced behaviour which can have some negative impact on health and nutritional status of a person (Lobel, 2002).

Stress was measured using the modified and standardized stress scale developed by Norman Shealy (1983). The stress level assessment was done from a wide variety of behavioural domains including stress from diet, stress from environment, lack of sleep, personal relations, social activities and job stress and it contains thirty five items. The responses

were obtained on a three-point continuum from never, sometimes true, always true.

### **Health Status**

The health status of the women workers in the rubber plantation is related to the occupation. It is essential to find out the occupational hazards of a person when the health profile is prepared. Rating scale was used to assess the occupational hazards met by the women workers and the data was collected by interview method (Appendix XII).

### **Statistical tools used**

The following statistical tools were used for analyzing the data.

#### **Correlations**

Simple correlations were computed to find out the relationship between the various independent variables and dependent variables.

#### **Frequency score index**

Based on the frequency of use of various food items by respondents food use frequency scores were calculated as suggested by Reaburn et al. (1979).

$$\text{Percentage of Total Score} = \frac{R_1 S_1 + R_2 S_2 + \dots + R_n S_n}{n}$$

Sn = Scale of rating

Rn = Percentage of respondents selecting a rating

n = Maximum scale rating

#### **T test**

T test was employed to find out the significant differences between the mean scores of dependent and independent variables.

Some of data are interpreted in terms of frequency and percentages ,mean.



## *Results*

## 4. RESULT

The result of this study is illustrated in this chapter under different sections. Further statistical analysis is done to assess the impact, relationship and association if any between the independent and dependent variables and the results were presented under the following heads.

- 4.1. Socio-economic background of the respondents and families
- 4.2. Food consumption pattern of the respondents and families
- 4.3. Personal characteristics and work pattern of the respondents
- 4.4. Assessment of the nutritional status of the respondents
- 4.5. Stress determinants of the respondents

### 4.1 SOCIO-ECONOMIC BACKGROUND OF THE FAMILIES

The socio-economic profile of the selected families includes eighty plantation workers (Experimental Group) and twenty housewives (Control group). Both were studied with reference to their age, religion, caste, sex, family size, type of family, annual income, educational status of the respondents and the family, occupational status of the family and availability of basic facilities and amenities at home.

#### 4.1.1 Age

Table 1. Age wise distribution of the respondents

Age Range	Experimental Group		Control Group	
	Number	Percentage	Number	Percentage
25-35	14	17	12	60
36-45	43	54	6	30
>45	23	29	2	10
Total	80	100	20	100

The above table revealed that majority (53.75 percent) of the respondents belonged to the age group 36-45 .While 28.75 percent belonged to above 45 years and 17.5 percent belong to the age group of 25-35.

In the control group 60 percent were belonging to the age group of 25-35 while 30 percent belonged to the age group 36-45 and 10 percent belonged to above 45 years.

#### 4.1.2 Religion

Table 2. Distribution of respondents based on religion

Religion	Experimental group		Control group	
	No.	Per cent	No.	Per cent
Hindu	65	81.25	17	85.00
Christian	11	13.75	2	10.00
Muslim	4	5.00	1	5.00
Total	80	100	20	100

Majority of the respondents in the experimental group (81.25) belonged to Hindu and 13.75 percent belonged to Christian and the remaining 5 percent belonged to the Muslim community.

In the control group 85 percent belonged to Hindu and 10 percent belonged to Christian and remaining 5 percent were from Muslim community

#### 4.1.2 Caste

Table 3. Caste wise distribution of the respondents

Caste	Experimental Group		Control Group	
	Number	Per cent	Number	Per cent
SC/ST	35	43.75	10	50
OBC/OEC	31	38.75	2	10
Others	14	17.5	8	40
Total	80	100	20	100

The caste wise distribution of the respondents depicted in the Table 3 showed that majority of the respondents (43.75) belonged to SC/ST category and 38.75 percent of the respondents were belonged OBC/OEC and the remaining 17.5 percent belonged to other forward castes.

In control group 50 percent were from SC/ST category, 10 per cent were from OBC/OEC and 40 percent were from forward community.

#### 4.1.4 Family Composition

Table 4. Composition of family

Respondents (Group)	Age wise distribution of member	Sex wise distribution of family												Total members
		No. of male members						No. of female members						
		1	2	3	4	5	Total	1	2	3	4	5	Total	
Experimental	> 18 years	34	10	-	-	-	54	25	4	-	-	-	33	87
	< 18 years	43	23	6	1	1	116	29	34	16	1	1	149	270
	Total	77	66	18	4	5	170	54	76	48	4	5	357	357
Control	> 18 years	11	1	-	-	-	13	8	2	-	-	-	12	25
	< 18 years	19	-	-	-	-	19	14	5	1	-	-	27	46
	Total	30	2	-	-	-	32	22	14	3	-	-	71	71

In experimental group among the 80 families surveyed 54 members were under the age group below 18 years and 33 female members were in the same age group and which gives a total of 87 members under the age group below 18 years.

In the age group above 18 years 116 male members and 149 female members and gives a total of 270 members above 18 years. Out of the 80 families studied, there were 357 members in total.

In control group among 20 families surveyed 13 male members were below 18 years and 25 female members in the same age group and the total of below 18 years in both the age group was 25. The respondents above 18 years were 19 males and females 27. Out of the 20 families surveyed, there were 71 members in total.

#### 4.1.5 Family type

Table 5. Distribution of respondents based on family type

Family Type	Experimental Group		Control Group	
	Number	Percent	Number	Percent
Nuclear	47	58.75	17	85
Joint	33	41.25	3	15
Total	80	100	20	100

Family type is classified into, nuclear and joint based on composition. Joint families include the parents, children and grand parents and nuclear families have only parents and their children. Table 5 revealed that majority were from nuclear families, (47 out of 80 i.e. 58.75 percent) and 41.25 percent come from joint families in the experimental group whereas in the control group 85 percent were from in the nuclear families and 15 percent were from joint families.

#### 4.1.6 Family Size

Table 6. Distribution of respondents based on their family size

Family Size	Experimental Group	Control Group
	Number	Number
Small (1-4)	64 (80)	20 (100)
Medium (5-7)	13 (16.25)	-
Large (8above)	3 (3.75)	-
Total	80	20

(Figures in parenthesis indicate the percentage)

The family size were classified as Small (1-4 members) Medium (5-7 members) and Large ( $\geq 8$  members). The family size distribution Table 5 reveals

that 80 percent of the experimental group was in the Small family and 16.25 were in Medium family size and rest i.e. 3.75 per cent, belonged to Large families. While in the control group 100 per cent ie.20 families belonged to Small family.

#### 4.1.7 Educational status

Table 7. Distribution of Educational status of the respondents

Educational status	Experimental Group	Control Group
	Number	Number
Illiterate	3 (3.75)	-
Primary	15 (18.75)	2 (10)
Upper Primary	14 (17.5)	3 (15)
High School	40 (50)	10 (50)
Pre-Degree	5 (5)	3(15)
Degree	4 (5)	-
Post Graduation	-	2 (10)
Total	80 (100)	20 (100)

(Figures in parenthesis indicate the percentage)

Educational attainment of the respondents (Experimental Group) indicated that only 3.75 percent were illiterate, 18.75 percent got primary level education while 17.5 percent got upper primary level education. Majority of the group (50 percent) were obtained high school level education and rest of them undergone degree level (5 percent) and postgraduate level education (5 percent).

In the control group 10 percent got primary level and 15 percent got upper primary level education. Majority of this group *i.e.* 50 percent have got high school level education and 15 percent attained pre degree level and 10 percent had post graduate level education. In control group none of them were illiterate.

#### 4.1.8 Economic Status of the Respondents

Women are said to seek employment outside their houses, to meet the basic requirements of the family .In many cases this was either to supplement the family income or to support the family solely. Enquiries pertaining to this aspect have

revealed that 10 percent of the women taken the burden of the household solely on themselves.

Table 8. Distribution of the monthly income of the respondents of Experimental Group (n=80)

Monthly Income (Rs.)	Number of respondents
1500-2000	11 (13.75)
2001-2500	59 (73.75)
>2500	10 (12.5)

(Figures in parenthesis indicate the percentage)

Majority (73.75 percent) of the respondents had a monthly income of Rs.2500 whereas 13.75 percent were having a monthly income between Rs. 1500-2000 and 12.5 percent had a monthly income above Rs 2500. In control group the respondents are housewives and they didn't have any individual income.

Table 9. Distribution of monthly income of the family

Experimental Group (n=80)		Control group (n=20)	
Monthly Income (Rs)(range)	Number of respondents	Monthly Income (range)	Number of respondents
2500-5000	46 (57.5)	2500-5000	15 (75)
>5000-7500	33 (41.25)	>5000-7500	3 (15)
>7500-10000	1 (1.25)	>7500-10000	2 (10)

(Figures in parenthesis indicate the percentage)

The above table reveals that 57.5 percent of the respondents had the monthly family income between 2500-5000 and 41.25 percent were having income between 5000-7500 while 1.25 percent had income above 7500 Rs. In control group 75 percent of the respondents have the income between 2500-5000 Fifteen percent were in the income range 5000-7500 and 10 percent were having the income above 7500 Rs.

Table 10. Per capita Income of the Family

Per capita Income (Rs)	Experimental Group	Control Group
<500	1(1.25)	-
>500-1500	76 (95)	17 (85)
>1500-2500	2 (2.5)	1 (5)
>2500-3500	1(1.25)	1 (5)
>3500	-	1 (5)
Mean per capita income	1184.63	1327.56

(Figures in parenthesis indicate percentage)

Table 10 shows the monthly per capita income of the family. In the experimental group the per capita income was Rs.1185/- whereas in control group it was Rs.1328/-.

Table 11. Distribution of respondents based on economic status and Occupational status of the family (Experimental Group)

Monthly income	1 casual worker	2 casual workers	1 casual+ 1 regular worker	1 Regular worker	1 casual worker + Govt. job	Total
2500-5000	1 (0.578)	4 (2.31)	46 (26.58)	34 (19.65)	2 (1.156)	87 (50.29)
>5000-7500	5 (2.89)	26 (15.02)	30 (17.34)	18 (10.40)	3 (1.73)	82 (47.40)
>750010000	1 (0.578)	-	-	1 (0.578)	2 (1.156)	4 (2.31)
Total	7 (4.05)	30 (17.34)	76 (43.93)	53 (30.63)	7 (4.05)	173 (100)

(Figures in parenthesis indicate the percentage)

Regarding the type of occupation taken up by the family members of women belonging to experimental group, regular as well as casual jobs was taken up. Regular jobs were taken up by 30.63 percent of family



members while government jobs were secured by 4 per cent of the family members (Table 11); 17.34 per cent were having two casual workers where as 4.05 percent families depended on single wage earners and 43.93 percent of the families were having one casual and one regular wage earner.

#### 4.1.9 Educational Status of the Family Members

The total numbers of the family members of the 100 families surveyed were 418 and their educational status given in (Table 12).

Table 12. Distribution of educational status of the family members

Educational status	Experimental Group (n=347)	Control Group (n=71)
	Number	Number
Illiterate	34 (9.79)	5 (7.04)
Primary	51 (14.69)	16 (22.53)
Upper Primary	52 (14.98)	7 (9.85)
High School	138 (39.76)	30 (42.25)
Pre-Degree	51 (14.69)	7 (9.85)
Degree	14 (4.03)	3 (4.22)
Post Graduation	1 (0.28)	3 (4.22)
Other certificate courses	6 (1.72)	-

(Figures in parenthesis indicate the percentage)

Educational attainment of the families indicated that 34 members were illiterate of which 17 children were below 5 years. In control group 5 members were illiterates in which two children were below 5 years of age. The educational status of the family indicated that most of the people (40 percent) got high school level education whereas in the control group 42 percent members had high school level of education. In experimental

group one of them had post graduate level education whereas in the control group three had postgraduate level of education.

#### 4.1.10 Monthly Expenditure Pattern

Table13 (a) and Table13 (b) Presents the monthly expenditure pattern of the experimental group and control group respectively. On observing monthly expenditure patterns of the families it reveals that respondents spent majority of their income for the purchase of food items.

Table 13 (a) Distribution of the respondents based on monthly expenditure pattern  
(Experimental Group n=80)

Sl. No.	Items	Expenditure (Amount in Rs.)				
		0	<100	100-500	500-1000	>1000
		Number	Number	Number.	Number	Number
1	Food	-	-	4 (5)	27 (33.75)	49 (61.25)
2	Clothing	62 (77.5)	11 (13.75)	4 (5)	3 (3.75)	-
3	Housing	65 (81.25)	14 (17.5)	1 (1.25)	-	-
4	Electricity	6 (7.5)	54 (67.5)	20 (25)	-	-
5	Fuel	68 (85)	12 (15)	-	-	-
6	Traveling	-	68 (85)	12 (15)	-	-
7	Education	27 (33.75)	24 (30)	19 (23.75)	10 (12.5)	-
8	Recreation	73 (91.25)	5 (6.25)	2 (2.5)	-	-
9	Health	49 (61.25)	21 (26.25)	9 (11.25)	1 (1.25)	-
10	Savings	54 (67.5)	16 (20)	10 (12.5)	-	-
11	Miscellaneous	76 (95)	3 (3.75)	1 (1.25)	-	-

(Figures in parenthesis indicate the percentage)

The distribution table for experimental group (Table 13(a)) reveals that majority (61.25) percent of the respondents spent Rs. above 1000 for food items, while 33.75 percent of the respondents spent Rs. in the range of 500-1000 and the rest 5 percent spent 100-500 Rs. The expenditure for fuel, housing

and recreation was found to be very low. Twenty six percent spent below Rs.100 for health and 11 percent spent Rs.100-500 for health. Twenty percent spent below Rs.100 for savings and 12 percent spent Rs. 100 to 500 for savings and the majority 67.5 percent doesn't have any savings.

Table 13(b) Distribution of respondents based on monthly expenditure pattern  
(Control Group n=20)

Sl.No.	Items	Expenditure (Amount in Rs.)				
		0	<100	100-500	500-1000	>1000
		Number	Number	Number.	Number	Number
1	Food	-	-	1 (5)	13 (65)	6 (30)
2	Clothing	3 (15)	-	15 (75)	2 (10)	-
3	Housing	20 (100)	-	-	-	-
4	Electricity	-	8 (40)	11 (55)	1 (5)	-
5	Fuel	7(35)	2 (10)	11 (55)	-	-
6	Traveling	-	12 (60)	7 (35)	1 (5)	-
7	Education	5 (25)	3 (15)	8 (40)	3 (15)	1
8	Recreation	2 (10)	6 (30)	9 (45)	3 (15)	-
9	Health	5 (25)	10 (50)	3 (15)	2 (10)	-
10	Savings	11 (55)	3 (15)	4 (20)	2 (10)	-
11	Miscellaneous	-	9 (45)	11(55)	-	-

(Figures in parenthesis indicate the percentage)

Monthly expenditure of the families (Table 13(b) shows that 65 percent of the respondents spent between 500-1000 Rs. for food items while 30 percent of them spent above Rs.1000, for food. Fifty five per cent of the respondents spent Rs.100-500 for fuel and electricity. The expenditure incurred for health was below Rs.100 by majority of the family.

## 4.2 Dietary Habits

### 4.2.1 Food Consumption Pattern of the Family and Respondents

Food consumption pattern of the families was assessed with regard to their dietary practice, expenditure pattern on food items, frequency of use of various food items and food frequency scores. The results obtained are presented in the tables 14 to17.

### Food Habit

Table 14. Distribution of the respondents based on their food habits

Food Habits	Experimental Group	Control Group
	Number	Number
Vegetarians	6 (7.5)	-
Non Vegetarians	74 (92.5)	20 (100)
Total	80	20

(Figures in parenthesis indicate the percentage)

Table 14 depicts that the eating habits prevalent among the families under study in experimental and the control group. In the experimental group majority of the respondents (92.5 percent) were non-vegetarians and 7.5 percent were vegetarians. Though they were branded as non-vegetarians the consumption of fish was very high among the families surveyed and they consumed other non-vegetarian food items once in a month or occasionally. In control group all the respondents were found to be non-vegetarians.

### Monthly food expenditure pattern of the family (Experimental group)

Table 15 (a) shows that the monthly food expenditure pattern of the family in experimental group. 43.75 percent of the respondents spent less than 25 percent of their total income for food. Eighteen percent spent 25 to 50 percent for food and 37.5 percent of the respondent spent above 50 percent of their total income for food. Forty-two respondents spent 10 to 20 percent of their total income for cereals whereas 66 respondents spent only 1 to 2 percent of their total income for green leafy vegetables.

Table 15 (b) depicts the monthly food expenditure pattern of the control group, 35 percent of the respondents spent below 25 percent of the total income for food. 45 percent spent 25 to 50 percent on food and 20 percent of the respondents spent above 50 percent of their total income on food. Most of the respondents in the control group spent 10 to 20 percent of their total income on cereals whereas 19 respondents out of twenty spent only 1 to 2 percent of their total income on green leafy vegetables. It is clear that least used food items included in their daily dietary pattern were green leafy vegetables.

Table 15 (a) Monthly food expenditure pattern of the family (Experimental group)

Total income  Percentage→	Cereals			Pulses			Green leafy vegetables			Other vegetables			Roots and tubers			Fruits			Nuts and oil seeds			Milk and milk products		
	≤ 10	10-20	>20	≤ 4	4-8	>8	≤ 1	1-2	>2	≤ 5	5-10	>10	≤ 2	2-4	>4	≤ 2	2-5	>5	≤ 2	2-4	>4	≤ 4	4-8	>8
>2500- 5000	6	25	15	8	21	17	18	20	8	28	13	5	30	14	2	27	15	4	5	28	13	32	10	4
>5000 – 7500	3	17	13	15	14	4	12	15	6	30	2	1	28	4	1	28	4	1	30	2	1	21	8	4
>7500	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-
<b>Total</b>	<b>10</b>	<b>42</b>	<b>28</b>	<b>24</b>	<b>35</b>	<b>21</b>	<b>31</b>	<b>35</b>	<b>14</b>	<b>59</b>	<b>15</b>	<b>6</b>	<b>59</b>	<b>18</b>	<b>3</b>	<b>56</b>	<b>19</b>	<b>5</b>	<b>36</b>	<b>30</b>	<b>14</b>	<b>54</b>	<b>18</b>	<b>8</b>

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Total income  Percentage→	Fats and oils			Sugar and jaggery			Animal foods			Spices and condiments			Bakery items			Processed foods			Total food expenditure (%)			Total family's expenditure			
	≤ 2	2-4	>4	≤ 3	3-6	>6	≤ 5	5-10	> 10	≤ 5	5-10	>10	≤ 1	1-2	>2	≤ 2	2-4	>4	≤ 25	>25-50	> 50	≤ 1000	1000 - 2000	2000- 3000	> 3000
>2500- 5000	7	36	3	31	10	5	29	15	2	32	12	2	25	20	1	26	18	2	7	11	28	1	20	25	-
>5000 – 7500	18	12	3	28	3	2	30	2	1	27	4	2	22	6	5	23	9	1	27	4	2	-	8	19	6
>7500	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	-	-	-	1
<b>Total</b>	<b>26</b>	<b>48</b>	<b>6</b>	<b>60</b>	<b>13</b>	<b>7</b>	<b>60</b>	<b>17</b>	<b>3</b>	<b>60</b>	<b>16</b>	<b>4</b>	<b>48</b>	<b>26</b>	<b>6</b>	<b>50</b>	<b>27</b>	<b>3</b>	<b>43.75</b>	<b>18.75</b>	<b>37.5</b>	<b>1</b>	<b>28</b>	<b>44</b>	<b>7</b>

Table 15 (b) Monthly food expenditure pattern of the family (Control group)

Total income↓ Percentage→	Cereals			Pulses			Green leafy vegetables			Other vegetables			Roots and tubers			Fruits			Nuts and oil seeds			Milk and milk products		
	≤10	10-20	>20	≤4	4-8	>8	≤1	1-2	>2	≤5	5-10	>10	≤2	2-4	>4	≤2	2-5	>5	≤2	2-4	>4	≤4	4-8	>8
>2500-5000	10	3	2	8	3	4	12	2	1	9	3	3	12	2	1	5	9	1	12	3	-	8	4	3
>5000-7500	-	3	-	1	2	-	2	1	-	1	2	-	3	-	-	2	1	-	3	-	-	1	1	1
>7500	1	1	-	-	2	-	2	-	-	1	-	1	2	-	-	-	1	1	-	2	-	-	1	1
<b>Total</b>	<b>11</b>	<b>7</b>	<b>2</b>	<b>9</b>	<b>7</b>	<b>4</b>	<b>16</b>	<b>3</b>	<b>1</b>	<b>11</b>	<b>5</b>	<b>4</b>	<b>17</b>	<b>2</b>	<b>1</b>	<b>7</b>	<b>11</b>	<b>2</b>	<b>15</b>	<b>5</b>	<b>-</b>	<b>9</b>	<b>6</b>	<b>5</b>

Total income↓ Percentage→	Fats and oils			Sugar and jaggery			Animal foods			Spices and condiments			Bakery items			Processed foods			Total food expenditure (%)			Total family's expenditure			
	≤2	2-4	>4	≤3	3-6	>6	≤5	5-10	>10	≤5	5-10	>10	≤1	1-2	>2	≤2	2-4	>4	≤25	>25-50	>50	≤1000	1000-2000	2000-3000	>3000
>2500-5000	5	8	2	9	3	3	5	9	1	12	2	1	9	6	-	13	1	1	2	9	4	-	2	5	8
>5000-7500	-	3	-	1	1	1	-	2	1	3	-	-	-	3	-	3	-	-	3	-	-	-	-	2	1
>7500	-	2	-	1	1	-	-	1	1	1	1	-	-	2	-	-	1	1	2	-	-	-	-	-	2
<b>Total</b>	<b>5</b>	<b>13</b>	<b>2</b>	<b>11</b>	<b>5</b>	<b>4</b>	<b>5</b>	<b>12</b>	<b>3</b>	<b>16</b>	<b>3</b>	<b>1</b>	<b>9</b>	<b>11</b>	<b>-</b>	<b>16</b>	<b>2</b>	<b>2</b>	<b>35</b>	<b>45</b>	<b>20</b>	<b>-</b>	<b>2</b>	<b>7</b>	<b>11</b>

#### 4.2.2 Food use frequency

Frequency of use of various food items by the respondents were assessed and the details are presented in Table 16(a) (Experimental Group) and Table 16 (b) (Control Group).

Table 16 (a) Frequency of use of various food items (Experimental Group n=80)

Frequency	Daily (6)	Thrice in a week (5)	Twice in a week (4)	Once in a week (3)	Monthly (2)	Occasionally (1)	Never (0)
Food Items	Number	Number	Number	Number	Number	Number	Number
Cereals	80 (100)	-	-	-	-	-	-
Pulses	2 (2.5)	6 (7.5)	21(26.25)	19(23.75)	3 (3.75)	24 (30)	5 (6.25)
Green leafy vegetables	4 (5)	12 (15)	12 (15)	24 (30)	-	26 (32.5)	2 (2.5)
Other vegetables	15(18.75)	14(17.5)	30(37.5)	21(26.25)	-	-	-
Roots and tubers	20 (25)	5 (6.25)	10(12.5)	17(21.25)	4 (5)	24 (30)	-
Fruits	-	2 (2.5)	4 (5)	5 (6.25)	11(13.75)	54 (67.5)	4 (5)
Nuts/oilseed	80 (100)	-	-	-	-	-	-
Milk and milk products	75(93.75)	-	1 (1.25)	-	-	-	4 (5)
Fats and oils	80 (100)	-	-	-	-	-	-
Sugar and jaggery	73(91.25)	-	-	-	-	-	7 (8.7)
Egg	6(7.5)	4(5)	6(7.5)	8(12.5)	12(15)	28(35)	14(17.5)
Fish	54 (67.5)	6 (7.5)	8 (10)	2 (2.5)	-	2 (2.5)	8 (10)
Meat	-	1(1.25)	1(1.25)	6(7.5)	13(16.25)	44(55)	15(18.75)
Spices and condiments	80 (100)	-	-	-	-	-	-
Bakery Items	5 (6.25)	-	3 (3.75)	2 (2.5)	3 (3.75)	39 (48.75)	28 (35)
Processed foods	16 (20)	2 (2.5)	9 (11.25)	28 (35)	2 (2.5)	17 (21.25)	6 (7.5)

(Figures in parenthesis indicate the percentage)

Table 16 (a) depicts that the food items like cereals, nuts and oilseeds (coconut), spices and condiments, fats and oils were consumed daily by all the respondents. Ninety one percent of the families used sugar and jaggery; and 67.5

percent used fish and 93.75 percent consumed milk in their daily diet. 30 percent respondents consumed pulses occasionally, 26.25 percent respondents consumed pulses twice in a week. 37.5 percent respondents used vegetables twice in a week and 18.75 percent of the respondents consumed it daily. Thirty two percent of the respondents included green leafy vegetables in their diet occasionally. Thirty percent respondents consumed roots and tubers occasionally while 67.5 percent of the respondents included fruits occasionally in their diet. Considering the protein rich foods like meat and egg, 55 percent consumed meat occasionally and 35 per cent of respondents consumed egg occasionally. Bakery items were found to be the least used food item by the respondents i.e., 48.75 percent used occasionally and 35 percent never used it.

Table 16 (b) Frequency of use of various food items (Control Group n=20)

Frequency	Daily (6)	Thrice in a week (5)	Twice in a week (4)	Once in a week (3)	Monthly (2)	Occasionally (1)	Never (0)
Food Items	Number	Number	Number	Number	Number	Number	Number
Cereals	20(100)	-	-	-	-	-	-
Pulses	7 (35)	1 (5)	1 (5)	7 (35)	1 (5)	13 (15)	-
Green leafy vegetables	8 (40)	4 (20)	2 (10)	3 (15)	-	1 (5)	2 (10)
Other vegetables	9 (45)	4 (20)	5 (25)	2 (10)	-	-	-
Roots and tubers	13 (65)	1 (5)	2 (10)	2 (10)	2 (10)	-	-
Fruits	7 (35)	2 (10)	2 (10)	7 (35)	1 (5)	1 (5)	-
Nuts/oilseed	20(100)	-	-	-	-	-	-
Milk and milk products	18 (90)	-	-	-	-	-	2 (10)
Fats and oils	19 (95)	-	-	-	-	-	1 (5)
Sugar and jaggery	17 (85)	-	-	-	-	-	3 (15)
Egg	8 (40)	2 (10)	2 (10)	1 (5)	-	2 (10)	3 (15)
Fish	13 (65)	2(10)	1(5)	-	-	1(5)	3 (15)
Meat	-	-	1(5)	4 (15)	8 (40)	4 (20)	3 (15)
Spices and condiments	20(100)	-	-	-	-	-	-
Bakery Items	3 (15)	-	2 (10)	5 (25)	4 (20)	5 (25)	1 (5)
Processed foods	6 (30)	2 (10)	1 (5)	5 (25)	1(5)	1 (5)	4 (20)

(Figures in parenthesis indicate the percentage)

Table 16 (b) revealed that the food items like cereals, nuts and oilseeds, spices and condiments were consumed daily by all the respondents. Eighty five



percent of the families used sugar and jaggery daily; and 65 percent used fish and 90 percent were found to use milk in their daily diets. Thirty five percent respondents consumed pulses daily, Thirty five per cent twice in a week and 15 percent were consume occasionally. Forty five per cent of the respondents consumed vegetables daily and 25 per cent twice in a week. Forty per cent of the respondents included green leafy vegetables in their daily diet. Sixty five percent of the respondents consumed roots and tubers daily while 35 percent of the respondents included fruits daily and 35 percent consumed it once in a week. Considering the protein rich foods like meat and egg, 40 percent consumed egg daily; 40 percent used meat monthly 20 percent occasionally and 15 percent never used meat, egg respectively. Bakery items were found to be least used by the respondents i.e., 25 percent of the respondents use occasionally and 5 percent never used. Thirty percent consumed processed foods daily in their diet while 20 percent never used them.

Table 17 (a). Food frequency scores obtained by the respondents for various food groups (Experimental Group n=80)

Food Items	Average Scores	Percentage of total scores
Cereals	6	100.00
Pulses	2.70	44.40
Green leafy vegetables	3	50.00
Other vegetables	4.3	71.50
Roots and tubers	3.4	55.80
Fruits	4.5	75.00
Nuts and oilseeds	6.0	100.00
Milk	5.7	94.60
Meat	1.2	20.20
Egg	2	33.10
Fish	4.9	82.10
Fats and oils	6	100.00
Sugar and Jaggery	5.5	91.30
Spices and condiments	6	100.00
Bakery Items	0.9	14.20
Processed foods	3.1	51.50

Table 17(a) depicts the average food use frequency scores and percentage of total scores obtained for each food group. Percentage food frequency score of

100 was obtained for food items like cereals, nuts and oilseeds (coconut) fats and oils, spices and condiments. A percentage score of 91.3 and 94.6 was obtained for foodstuffs like sugar and jaggery and milk. The percentage scores for other vegetables were 71.5 and for roots and tubers were 55.8. A score of 50 obtained for green leafy vegetables. Foodstuffs like pulses and fruits scored 44.4 and 24.4 respectively. Very low score was obtained for foodstuffs like meat, bakery items i.e., 20.2 and 14.2 whereas processed foods and egg were 51.5 and 33.1 respectively.

Table 17 (b) Food frequency scores obtained by the respondents for various food groups (Control Group N=20)

Food Items	Average Scores	Percentage of total scores
Cereals	6	100.00
Pulses	3.9	64.20
Green leafy vegetables	3.5	58.33
Other vegetables	5	83.30
Roots and tubers	5.1	84.20
Fruits	4.2	70.00
Nuts and oilseeds	4.9	82.00
Milk and milk products	5.4	90.00
Meat	1.9	31.70
Egg	3.7	61.70
Fish	4.7	77.50
Fats and oils	5.7	95.00
Sugar and Jaggery	5.1	85.00
Spices and condiments	6	100.00
Bakery Items	2.5	40.80
Processed foods	4	66.70

Table 17(b) depicts the average food use frequency scores and percentage

of total scores obtained for each food group. Percentage food frequency score of 100 was obtained for food items like cereals and spices and condiments. The percentage score of 85 and 90 was obtained for foodstuffs like sugar and jaggery and milk. The percentage scores for other vegetables and roots and tubers were 83.3 and 84.2 respectively. Food stuffs like green leafy vegetables, pulses and fruits scored 58.33, 64.2 and 70 respectively. Very low score was obtained for foodstuffs like meat (31.7), bakery items (40.8) whereas for processed foods and egg the score was 66.7 and 61.7 respectively

Based on the percentage frequency score, food groups included in the daily dietaries by respondents were classified almost frequently used foods (percentage score above 80), medium frequently (percentage score 50-80) and less frequently used foods (percentage score below 50)

Table 18 (a) Frequency of use of food groups by the respondents

(Experimental Group)

Most frequently used foods	Medium frequently used foods	Less frequently used foods
Cereals	Other vegetables	Pulses
Milk and milk products	Roots and Tubers	Meat
Nuts and oilseeds	Processed foods	Egg
Fish	Green leafy vegetables	Bakery items
Sugar and jaggery	Fruits	
Fats and Oils		
Spices and condiments		

From the Table18 (a) it is revealed that cereals, milk and milk products, sugar and jaggery, fats and oils, spices and condiments were found to be most

frequently used food groups. Other vegetables, roots and tubers and processed foods, fruits found to be medium frequently used by the respondents. Pulses, Egg, bakery items, and meat found to be less frequently used foods.

Table 18 (b) Frequency of use of food groups by the respondents  
(Control Group)

Most frequently used foods	Medium frequently used foods	Less frequently used foods
Cereals	Pulses	Meat Bakery items
Other vegetables	Green leafy vegetables	
Roots and Tubers	Fruits	
Milk and milk products	Fish	
Sugar	Egg	
Fats and Oils	Processed foods	
Spices and condiments		

From the table 18 (b) it is revealed that cereals, milk and milk products, sugar and jaggery, other vegetables roots and tubers, fats and oils, spices and condiments, found to be most frequently used food groups. Green leafy vegetables, pulses, egg, fruits, fish and processed foods found to be medium frequently used by the respondents. Bakery items, and Meat were found to be less frequently used foods.

Table 19 Meal frequency followed by the respondents (Experimental Group N=80)

Meal frequency	Experimental Group	Control Group
	Number	Number
Two	4 (5)	3 (15)
Three	32 (40)	12 (60)
Four	44 (55)	5 (25)

(Figures in parenthesis indicate the percentage)

On assessing the meal frequency of the respondents (experimental group) it was found 55 percent of the families followed four meal pattern (Table 19).

Forty percent of the families followed three meal pattern and only 5 percent were followed two meal pattern (Table 16). While assessing the control group it was found that 60 percent followed three meal pattern and 25 percent four meal pattern where as 15 percent were followed two meal pattern.

#### 4.2.3 Food Preference

As in food use frequency, the preference for food items in different food groups was assessed using a checklist (Table 20). In addition to food groups other items such as different food preparations main dishes, snacks and beverages were also included.

Table 20 Distribution of respondents based on food preference score

Food groups	Experimental Group	Control Group
Cereals	98.00	98.50
Pulses	45.00	66.00
Green leafy vegetables	50.00	70.00
Roots and tubers	99.00	97.50
Other vegetables	71.50	85.50
Fruits	30.00	74.50
Meat	20.00	30.00
Fish	82.00	70.00
Milk and Milk products	90.50	96.00
Fats and oils	98.50	100.00
Sugar and Jaggery	99.00	100.00
Nuts and oil seeds	94.00	98.50
Condiments and spices	92.00	98.00
Bakery Items	20.00	40.00
Processed foods	50.00	66.00

The above table reveals that the food preference score for cereals in the experimental group was 98.00 and in the control group was 98.50, whereas preference score for green leafy vegetable was 50.00 and 70.00 per cent and for other vegetables the score was 71.50 and 85.50 per cent, the preference for roots and tubers was more and for experimental group it was 99.00 while control group it was 97.50 percent

Preference for nuts and oil seeds, condiments and spices of experimental group was 94.00 per cent and for control group it was 98.50 per cent. The result regarding the preference for milk was high when compared with other animal foods and for experimental group 90.50 and for control group 96.00 per cent. The preference for meat was 20 per cent and 30.00 experimental and control group respectively. The preference for fish was high among experimental group and (82.00 per cent) while comparing with control group (70.00 percent).

The preference for bakery items of experimental group was less when compared to control group (20.00 percent and 40.00 percent). While considering the processed foods the preference was 50.00 percent and 66.00 percent respectively for experimental group and control group

#### 4.3 PERSONAL CHARACTERISTICS AND WORK PATTERN OF THE RESPONDENTS

Personal characteristics such as age, experience, monthly income and job satisfaction were collected from the respondents. Working pattern, work output, resting hours and food intake in between the work, health hazards faced by the women and household responsibilities were the other details collected from the respondents. The results obtained are presented in tables 21 to 25.

Table 21. Distribution of respondents in relation to age

Experimental Group		Control Group	
Age (Years)	Percentage	Age (Years)	Percentage
25-35	17.5	25-35	60
36-45	53.75	36-45	30
Above 45	28.75	Above 45	10

As indicated in Table 20, in the experimental group, 53.75 percent of the respondents were in the age group of 36 to 45, 17.5 percent were in the age group

of 25 to 35 and 28.75 per cent were above 45. In the control group 60 per cent were belonging to the age group of 25 to 35 years, 30 per cent belonged to the age group of 36 to 45 and 10 per cent were above 45 years age.

Table 22. Distribution of respondents in relation to age and experience

(Experimental group)

Age (Years)	Number of women	Experience at work(Years)	Number of women
25-35	14 (17.5)	1-5	12 (15)
36-45	43 (53.75)	6-10	44 (55)
Above 45	23 (28.75)	Above 10	24 (30)

(Figures in parenthesis indicate percentage)

Fifty five percent of the respondents were found to have 6 to 10 years service, while 30 percent had an experience above 10 years. Fifteen percent of the respondents were found to have 1 to 5 years of service (Table 22).

Table 23. Mode of commutation of the respondents

Distance	Mode of transport	Time taken	Number of women
2 Furlong	Walking	10 mts.	10 (12)
0.5-1KM	Walking	20-30 mts.	19 (24)
1-3KM	Bus & Walking	30 mts. +10 mts.	51 (64)

(Figures in parenthesis indicate percentage)

Physical drudgeries associated with outside work were ascertained from amongst the respondents. Twelve per cent of the women stayed in quarters given by the plantation corporation while 24 per cent of the women stayed within 1 km. They walked and required half an hour to reach the work place.

Sixty four percent of the women stayed between 1-3 km from the work place and they took transport conveyance through bus and took 30 minutes and 10 minutes walking to reach the workplace.

### Monthly income of the respondent

Table 24. Monthly income of the respondents

Income (Range)(Rs.)	Number
2000-2200	11 (13.75)
2201-2500	59 (73.75)
>2500	10 (12.5)

(Figures in parenthesis indicate percentage)

Table 24 revealed that most of the respondents (73.75 percent) had a monthly income of Rs. 2200-2500 and 12.5 percent of them had an income above Rs. 2500, while 11 were having an income in the range of Rs. 2001-2200.

With regard to job satisfaction of the respondents 45 percent of them were not found to be satisfied with their job. Reasons given by the respondents for their dissatisfaction were deterioration in their health (48 percent), meagre wages (24 percent) and heavy workload(20 percent) , only 8 percent were satisfied with their work.

On assessing the work schedule of the respondents, it was found that Tapping workers begin their work at 5.30 am and field workers start their work at 8.00 am.

Workers tapped 375 trees per day and the latex collected range from 24 to 26 Kg per day.



Table 25. Work schedule followed by the respondents

Type of workers	Time schedule	Number of women
Skilled workers (Tappers)	5.30am-2.30pm	70 (87.5)
Field workers	8.00am-5.00pm	10(12.5)

(Figures in parenthesis indicate percentage)

On assessing the time spent by the respondents per day, they engaged for 9 hours per day for their work.

Work was performed efficiently by taking rest in between the work. Hence the resting pattern of the respondents was enquired and it was found that the worker took half an hour rest between the works in a day.

Table 26. Food Taken by the respondents in between work

Food Items	Percentage
Rice/ Paratta and curry	42 (52.5)
Coffee/Tea/ Kanji water	30 (37.5)
Nil	8 (10)
Total	80 (100)

(Figures in parenthesis indicate percentage)

Fifty three percent of the respondents had the habit of taking foods like rice/paratta and 37 percent take coffee/tea and 10 percent were not in the habit of taking any food in between work.

Sixty percent of the workers had the habit of taking food from outside and due to lack of time for food preparation whereas forty percent of them consumed homemade foods.

### Health problems related to work

About 85 percent of the respondents reported that they become sick quite often due to fever, anaemia, head ache, chest pain, shoulder pain, back pain etc. They got 15 days leave including sick leave in addition to other public holidays.

Table 27. Health problems of the respondents

Health problems	Experimental group (N=80)	Control group (N=20)
Frequent head ache	40 (50)	10 (50)
Shoulder pain	72 (90)	6 (30)
Back pain	75 (93.75)	9 (45)
High blood pressure	4 (5)	-
Heart problem	2 (2.5)	-
Breathing problem	4 (5)	1 (5)
Digestive problems	34 (42.5)	5 (25)
Skin irritations	23 (28.75)	1 (5)
Frequent urination	49 (61.25)	7 (35)
Fatigue	64 (80)	9 (45)
Cracks on feet	62 (77.5)	9 (45)
Poor eye sight	17(21.5)	4 (20)

(Figures in parenthesis indicate percentage)

The major health problems reported by the respondents from the experimental group were back pain (93.75 percent), shoulder pain (90 percent) fatigue (80 percent) Seventy eight percent of the respondents had cracks on feet. Skin irritations found in 28.75 percent of the respondents and 21.5 percent had poor eye sight . Doctors advised for frequent and prolonged treatments incase of diseases like high blood pressure (50 percent), heart problem (2.5 percent) and

breathing problem (5 percent) patients. In the control group the health problems reported by the respondents were digestive problems (25per cent) frequent urination (35 percent), fatigue (45 percent) and cracks on feet (45 percent).

Table 28. Health problems related to job stress

Health problems	Experimental group (N=80)	Control group (N=20)
Emotional Instability	9 (11.25)	3 (15)
Uncooperative attitude	4 (5)	-
Inability to relax	38 (47.5)	6 (30)
Anxiety	29 (36.25)	7 (35)
Anger	24 (30)	5 (25)
Tension	34 (42.5)	7 (35)
Frustration	21 (26.25)	2 (10)
Chronic worries	27 (33.75)	7 (35)
Nervousness	17 (21.25)	5 (25)

(Figures in parenthesis indicate percentage)

The above table reveals that job stress is associated with emotional instability (11.25), anxiety (36.25 percent) anger (30 percent), tension (42.5 percent), inability to relax (47.5 percent), frustration (26.25 percent), chronic worries (33.75 percent) and nervousness (21.25 percent). Majority of the respondents in experimental group reported that (Table 28) they were having more stress and strain related to work than the control group.

### Time Utilization pattern of the respondents

In order to assess the workload, the time utilization pattern of the respondents was studied and time spent for each activity per day was calculated and were given in Table 29.

Table 29. Time utilization of the respondents for various activities

Respondents (Group)	Mean time spent for each activity per day					t value
	Sedentary (in hours)	6.18	Moderate (in hours)	Heavy (in hours)	Sleep (in hours)	
Experimental	3.76	8.2	9	2.84	6.18	0.99**
Control	7.1	3.6	3.9	1.2	8.2	

\*\* significant at 5 % level

The average time spent by each group of experimental and control group are presented in Table 29.

In group wise distribution it is clear that time spent by experimental group for sedentary activities is less i.e.3.76hrs compared to the control group. It is found that control group spent more time (3.6hrs) for light activities when compared to experimental group. For moderate activities experimental group spent more time (9hrs) compared to control group. In experimental group they spent more time (2.84hrs) for heavy activity while control group spent more time (1.2 hrs). Control group spent more time for sleep (8.2 minutes) than experimental group (6.18hrs).

From this it is clear that there is significant difference in experimental and control group. The table also points that experimental group spent more time for moderate activities and they indulge only very little in light activities.

## Assessment of nutritional status of the respondents

### a) Actual food intake of the respondents

The dietary intake of all the respondents was assessed by 24-hour dietary recall method. This survey enables to analyze the quality and quantity of foods consumed by an individual and to locate the respondents (experimental (moderate) and control group (sedentary)) adequacy and inadequacy. Their diets were compared with the Recommended dietary Allowances stipulated by ICMR (1989).

Table 30(a) Average quantity of foodstuffs consumed by the respondents  
(Experimental Group n=80)

Food items	RDA (gms)	Average quantity consumed (gms)	Percentage of RDA met	Percentage deficit
Cereals	440	342.5	77.84	22.16
Pulses	45	27	61.00	39.00
Green leafy vegetables	40	21	52.50	47.50
Other vegetables	100	76.3	76.00	24.00
Roots and Tubers	50	28.5	57.00	43.00
Milk	150	135	90.00	10.00
Fats and oils	25	18	71.60	28.40
Fish	30	66.5	122 % above RDA	-
Sugar and jaggery	20	19	97.31	02.69
Fruits	60	78	29 % above RDA	-

\*(Source :ICMR –1989)

The actual quantity of food intake of the respondents was determined and compared with the Recommended Dietary Allowance and is presented in Table 30 (a) (Fig.1). There was a deficit shows of 48 percent in green leafy vegetables when compared with RDA. Forty three percent deficit was recorded for roots and

tubers, while the deficit for pulses and other vegetables were 39 percent and 24 percent respectively. The percentage deficit least recorded was for sugar and jaggery (3 percent). It was alarming to note that the consumption of fruits and fish were more than double the requirement suggested by ICMR (1989)

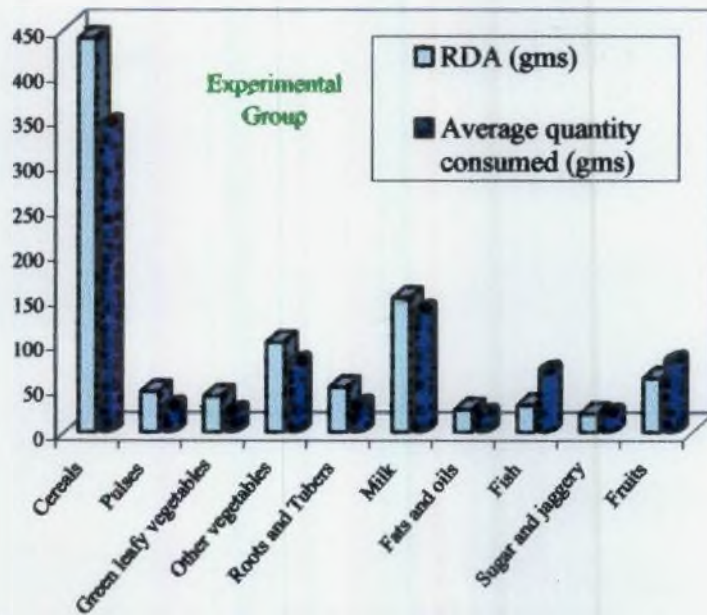
Table 30(b) Average quantity of foodstuffs consumed by the respondents

(Control Group n=20)

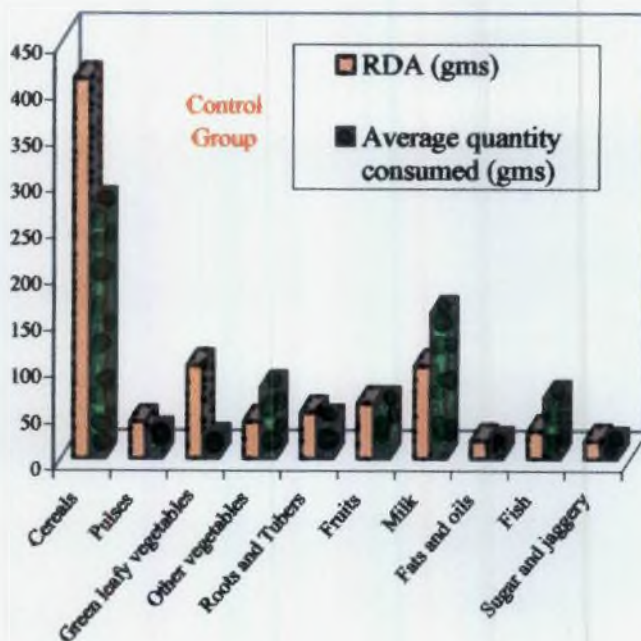
Food items	RDA (gms)	Average quantity consumed (gms)	Percentage of RDA met	Percentage deficit
Cereals	410	275	73.17	26.83
Pulses	40	26.66	66.66	33.34
Green leafy vegetables	40	20	50.00	50.00
Other vegetables	100	77	76.90	23.1
Roots and Tubers	50	40.58	81.16	18.84
Fruits	60	60	100.00	-
Milk	100	157.5	57 % above RDA	-
Fats and oils	20	17.4	82.90	17.1
Fish	30	66.75	123 % above RDA	-
Sugar and jaggery	20	17.16	85.79	14.21

\*(Source ICMR -1989)

From Table 30 b and Fig. 2, comparing RDA with the food intake it was found that consumption of fish, milk and fruits alone met the RDA. The percentage deficit for green leafy vegetable was 50 percent and the least percentage deficit was 14.21 percent and is for sugar and jaggery. It was noted that the consumption of milk and fish were more than the RDA.



**Fig. 1. Average quantity of food stuffs consumed by the respondents (Experimental Group)**



**Fig. 2. Average quantity of food stuffs consumed by the respondents (Control Group)**

Table 31 (a) Mean nutrient intake of the respondents (Experimental group)

Nutrients	RDA Adult woman (Moderate)	Nutrient Intake	Percentage of RDA met	Percentage deficit
Energy (Kcal)	2225	2292.9	3% above RDA	-
Protein (gm)	50	68.2	36% above RDA	-
Iron (mg)	30	16.18	53.93	46.07
Calcium (mg)	400	427	7% above RDA	-
Retinol ( $\mu$ g)	600	600.25	100.04	-
Thiamine (mg)	1.1	0.84	76.36	23.64
Riboflavin (mg)	1.3	1.47	13% above RDA	-
Niacin (mg)	14	15.71	12% above RDA	-
Vitamin C (mg)	40	40.4	1% above RDA	-
Fat (g)	20	35.1	76% above RDA	-

\*(Source: ICMR-1989)

While comparing the RDA with the nutrient intake, it is found that intake of energy, protein and calcium is higher than that recommended. The percentage deficit for iron was 46 percent and for thiamine it was 23.64 percent.

Table 31(b) Mean nutrient intake of the respondents (control group)

Nutrients	RDA Adult woman (Sedentary)	Nutrient Intake	Percentage of RDA met	Percentage deficit
Energy (K cal)	1875	2156.3	15% above RDA	-
Protein (gm)	50	68.2	36% above RDA	-
Iron (mg)	30	17.37	58% above RDA	42.1
Calcium (mg)	400	481.46	20% above RDA	-
Retinol ( $\mu$ g)	600	761.73	27% above RDA	-
Thiamine (mg)	0.9	0.98	9% above RDA	-
Riboflavin (mg)	1.1	1.51	37% above RDA	-
Niacin (mg)	12	16.58	38% above RDA	-
Vitamin C (mg)	40	38.46	96.15	3.85
Fat (g)	20	37.29	86% above RDA	-

\*(Source : ICMR, 1989)



Table 31(b) shows that the intake of energy, protein, calcium retinol, riboflavin, and niacin was higher than that of the recommended allowances. The percentage deficit for iron was 42 percent and vitamin C was 3.85 percent.

### Energy balance based on energy intake and expenditure

Energy balance was determined from the energy intake and energy expenditure. Energy intake was calculated in terms of BMR units (ICMR, 1989).

### Energy Intake

Table 32 Mean Energy Intake

Respondents	Mean Energy Intake/day (Kcal)	Recommended Energy Intake/day (Kcal)
Experimental	2293	*2225
Control	2156	*1875

\*Energy intake for Reference women (Moderate work)

\*Energy intake for Reference women (Sedentary work) (ICMR 1989)

The mean energy intake of the experimental group was 2293 Kcal, where it was 2156 Kcal in the control group

### Energy Expenditure

Table 33 Mean Energy Expenditure

Respondents	Energy spent for sleep (Kcal)	Energy spent for occupational activity (Kcal)	Energy spent for non occupational activity (Kcal)	Mean Energy Expenditure (Kcal)
Experimental	301	1241	861	2403
Control	403	1751	-	2159

The mean energy expenditure of the respondents in the experimental group was 2403Kcal and that of control group was 2159 Kcal.

In experimental group 61 percent and in control group 55 percent were negative energy balance as detailed in Appendix: VIII

## **b)Anthropometric measurements**

### **1. Weight for age profile of the respondents**

Use of weight for age in assessing the nutritional status of an individual gives the current status of the subject. It gives a clear picture of the changes in nutritional status.

Table 34 Distribution of respondents based on their body weight

Age (Years)	Experimental group (n=80)		Control group(n=20)	
	Mean weight (Kg)	Number of respondents	Mean weight (Kg)	Number of respondents
25-35	48.29	23	49.38	12
36-45	48.19	43	56.67	6
>45	48.5	14	52.5	2

Table 34 represents the weight for age profile of the respondents. In experimental group forty-three respondents in the age group of 36-45 had a mean weight of 48.19 Kg and the control group 6 respondents had the mean weight 56.67 Kg. In experimental group 23 respondents in the age group of 25-35 had 48.29Kg and the control group, 12 respondents had the mean weight of 49.38Kg and in the age group above 45, 14 respondents of the experimental group had 48.5Kg of mean weight and the control group 2 respondents had 52.5 Kg mean weight.

## 2. Average height for age profile of the respondents

Unlike weight deficit, height deficit gives a picture of the past nutritional status it is a reflection of the non-availability of the nutrients to the body over a prolonged period of time.

Table 35 Distribution of respondents based on their height

Age (Years)	Experimental group (n=80)		Control group (n=20)	
	Mean height (Kg)	Number of respondents	Mean height (Kg)	Number of respondents
25-35	151.27	14	151.46	12
36-45	151.01	44	152.83	6
>45	148.68	22	146.00	2

Table 35 reveals that average height for age profile of the respondents. Fourteen respondents of the experimental group in the age group of 25-35 years showed an average height of 151.27 cm, and average height of the control group in the same age group was 151.46 cm. In the experimental group 44 respondents in the age group of 36-45 years had the mean height 151.01 cm and the 6 respondents in control group had 152.83 cm. The mean height for the age group above 45 years was 148.68 cm for the experimental group (22 respondents) and 146 cm for the control group (2 respondents).

The ratio between height and weight was reflected in Body Mass Index (BMI). It was calculated and classified according to the severity of Chronic Energy Deficiency (CED). The body mass index was calculated using the formula,  $BMI = \text{weight (in Kg)}/\text{Height (in m}^2\text{)}$ .

The results obtained were classified according to James et al. (1988).

Table 36 Body Mass Index classifications of the respondents

BMI Class	Experimental group	Control group
16.0 (CED severe)	1 (1.25)	1(5)
16-17 (CED Moderate)	5 (6.25)	1(5)
17.1-18.5 (CED Mild)	12 (15)	1(5)
18.6-20 (Low weight, Normal)	18 (22.5)	4(20)
20-25 (Normal)	33 (41.25)	7(35)
Over weight	11 (13.75)	6(30)
Total	80 (100)	20(100)

(Figures in parenthesis indicate percentage)

In the present study one woman (1.25 percent) was chronically energy deficient, 5 women (6.25 percent) were moderately deficient and 12 women (15 percent) were mildly energy deficient. Eighteen women (22.5 percent) were low weight, normal; thirty-three women (41.25 percent) were found to be normal. Eleven women (13.75 percent) were overweight in experimental group (Fig. 3).

Whereas in control group one woman (5 percent) each chronically moderately and mildly energy deficient. Four women (20 percent) were found to be normal under low weight, normal. Seven women (35 percent) were found to be normal. Six women (30 percent) were over weight. (Fig. 4).

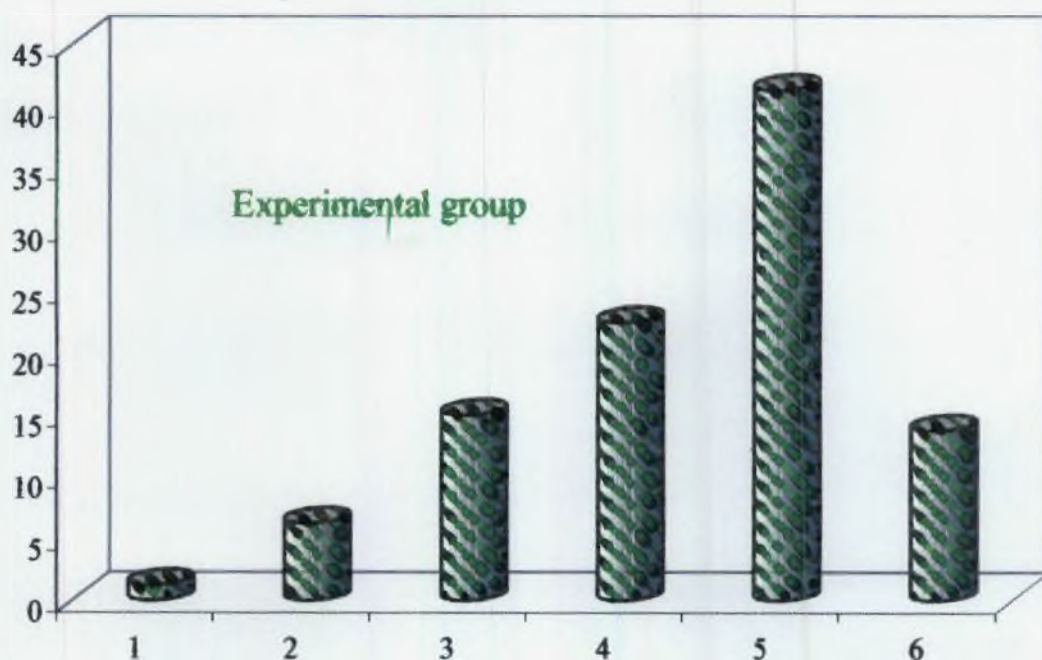
### 3. Waist Hip Ratio

Table 37 Waist Hip Ratio of the respondents

WHR	Below normal (< 0.8)	Normal (0.8)	Above normal (> 0.8)	Mean
Experimental group	20 (25)	54 (67.5)	6 (7.5)	0.83
Control group	6 (30)	11 (55)	3 (15)	0.84

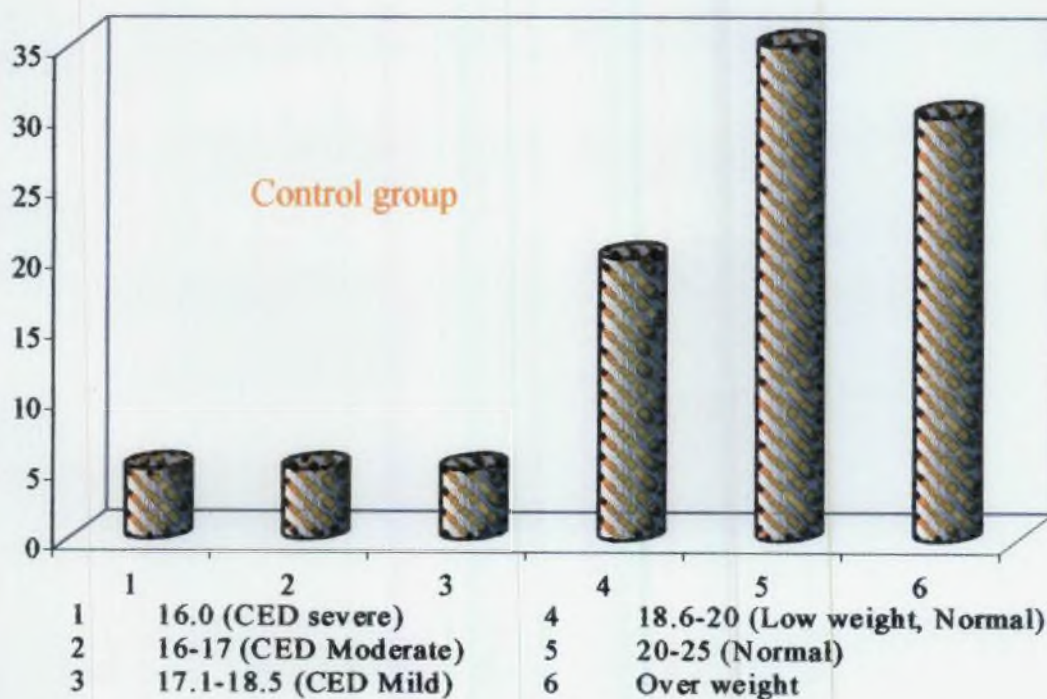
(Figures in parenthesis indicate percentage)

(Srilakshmi, 2003)



**Fig. 3. Body Mass Index classification of the respondents**

1	16.0 (CED severe)	4	18.6-20 (Low weight, Normal)
2	16-17 (CED Moderate)	5	20-25 (Normal)
3	17.1-18.5 (CED Mild)	6	Over weight



**Fig. 4. Body Mass Index classification of the respondents**

Table 37 reveals that waist Hip ratio of the respondents. In the experimental group 67.5 percent were having normal WHR and 25 percent were below normal whereas 7.5 percent were above the normal level. While in the control group normal WHR (55 percent), below normal (30 percent) and above normal (15 percent) WHR. The actual data is presented in Appendix - X.

#### 4. Mid Upper Arm Circumference of the respondents

The upper arm circumference taken between the acromion process and the elbow is an integrated measure for the skeletal, the muscular and the subcutaneous tissue components. This measurement is closely though not exactly, associated with changes in the subcutaneous tissues much because the tissue easily changes under varying circumferences.

Table 38 Mid – Upper arm circumference of the respondents

Arm circumference range (cm)	Experimental Group (n=80) Number	Control Group (n=20) Number
< 24	49(61.25)	6(30)
24.1-28.5	26(32.50)	8(40)
>28.5	5(6.25)	6(30)

(Figures in parenthesis indicate percentage)

The arm circumference of the respondents are shown in Table 38. In the present study it was observed that 61.25 percent of the experimental group i.e. they had the measurement below 24 cm, while in the control group 30 per cent had MUAC below 24cm and 32.5 per cent of the respondents in experimental group were in the range of 24.1 cm to 28 cm. While in control group the percentage was forty. In experimental group only 6.25 percent were observed to have arm circumference above 28cm whereas in control group it was 30 percent.

#### d) Clinical Assessment

The clinical examination of the respondents forms an important practical method for assessment of nutritional status of a community (Sumadivakar, 1999).

Table 39 Distribution of respondents with reference to incidence of clinical symptoms

Clinical Symptoms	Experimental group	Control Group
Oedema	13 (16.25)	2 (10)
Angular stomatitis	14 (17.5)	2 (10)
Spongy gum bleeding	11 (13.75)	3 (15)
Anaemia	54 (67.5)	9 (45)
Thyroid enlargement	1 (1.25)	-
Dental caries	30 (37.5)	6 (30)

(Figures in parenthesis indicate percentage)

Table 39 depicts that majority of the respondents were anaemic (i.e 67.5 per cent) in experimental group and 45 per cent in control group .The other clinical symptoms found in respondents were oedema (16.25 percent) spongy bleeding gum (13.75 percent) angular stomatitis (17.5 per cent) dental caries (37.5 percent) and thyroid enlargement (1.25 percent )in experimental group whereas in control group the clinical symptoms found in respondents were oedema (10 percent)spongy bleeding gum(15 percent) angular stomatitis (10 percent) and dental caries (30 percent).

#### E. Biochemical assessment

Biochemical assessment of the respondents was done by the estimation of haemoglobin level of their blood sample. The haemoglobin levels of both the respondents (experimental and control) are given in Table 40.

Table 40. Distribution of respondents based on haemoglobin level

Haemoglobin (gm /100 ml) Range	Experimental Group (N=80)	Control Group (N=20)
	Number of respondents	Number of respondents
Below 8	1(1.25)	-
>8.1-11.9	53 (66.25)	9 (45)
Above 12	26 (32.5)	11 (55)
Total	80 (100)	20 (20)

(Figures in parenthesis indicate percentage)

Table 40 (Fig. 5 and 6) reveals that 66.25 percent of the experimental group was below the normal level of haemoglobin while in control group it was 45 percent. The normal range of haemoglobin level was found in experimental (32.5 percent) and control group (55 percent).

#### Nutritional status Index of the respondents

Table 41 Nutritional status index of the respondents

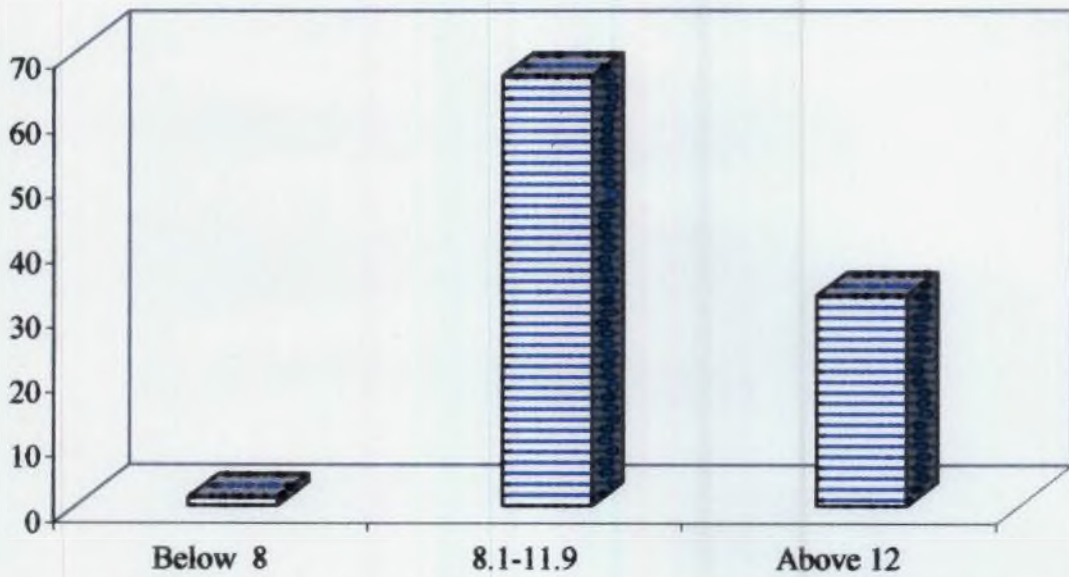
Experimental Group (n=80)			Control Group (n=20)		
Nutritional status index (Range)	Number of respondents	Mean NSI	Nutritional status index (Range)	Number of respondents	Mean NSI
250-300	16 (20)	290.09	250-300	4 (20)	289.72
300-350	61 (76.25)	321.04	300-350	15 (75)	324.35
>350	3 (3.75)	366.56	>350	3 (5)	363.49

(Figures in parenthesis indicate percentage)

Distribution of the respondents (experimental group) according to NSI is depicted in Table 41(Fig 7). The Nutritional Status Index of the respondents ranged from 300-350 for 76 percent of the respondents and they had the mean NSI

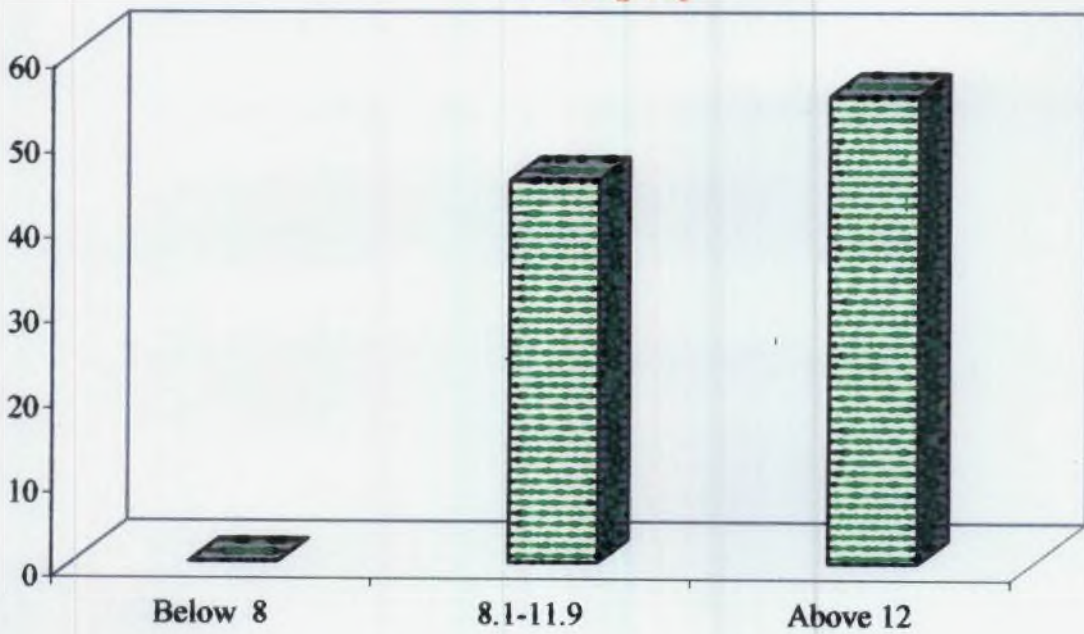


**Experimental group**

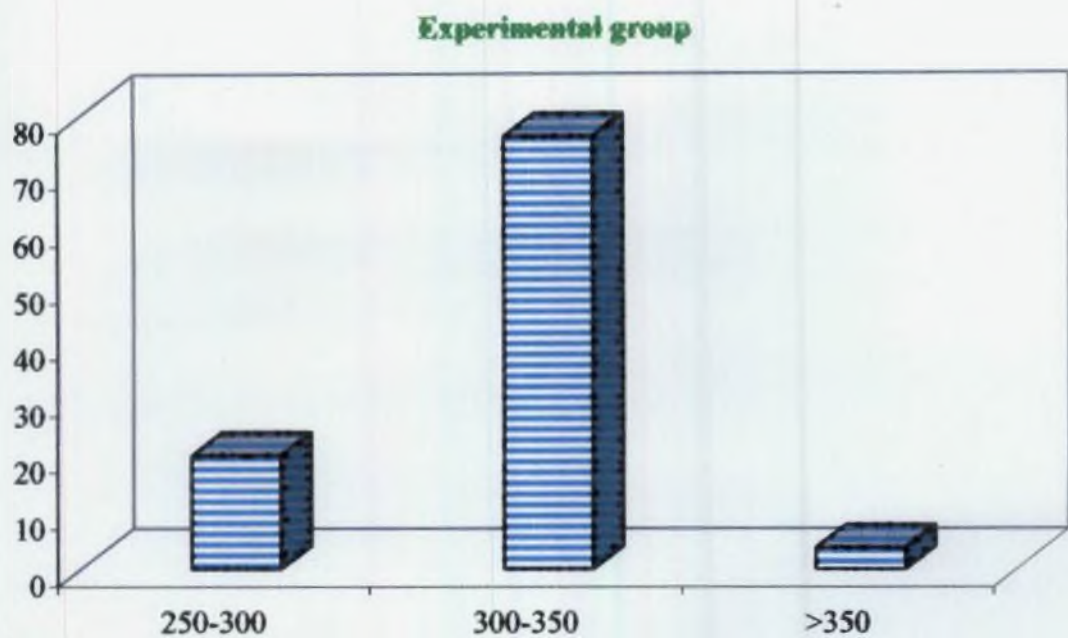


**Fig. 5. Distribution of respondents based on haemoglobin level**

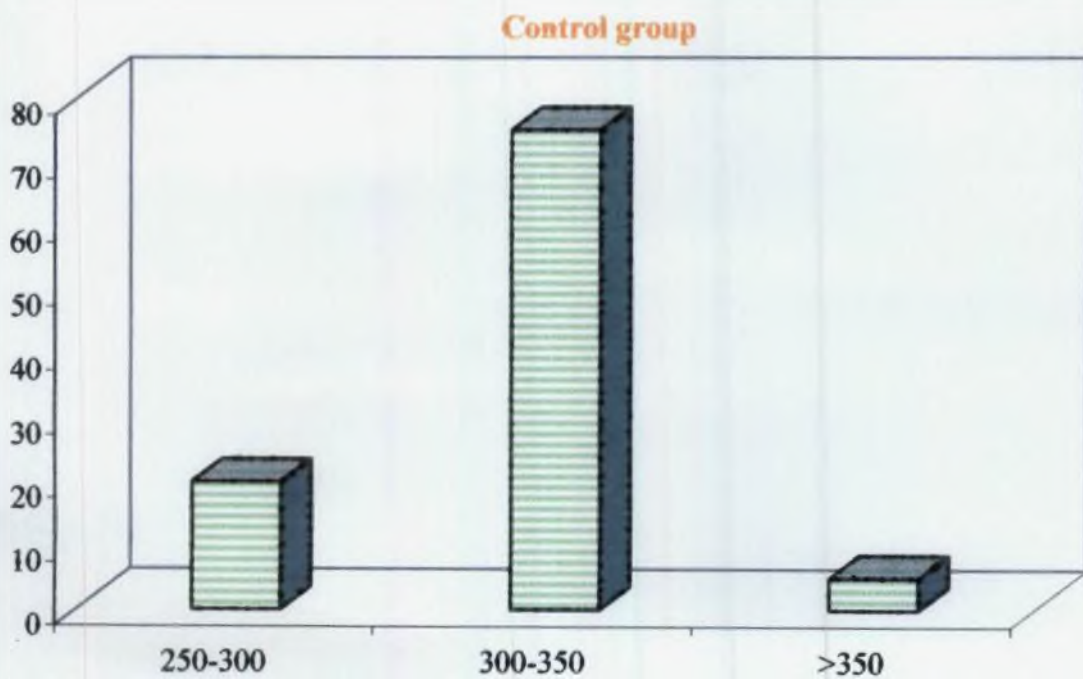
**Control group**



**Fig. 6. Distribution of respondents based on haemoglobin level**



**Fig. 7. Nutritional status index of the respondents**



**Fig. 8. Nutritional status index of the respondents**

of 321.04. Twenty percent of the respondents were having an average Nutritional Status Index of 290.09. NSI computed was above 350 in 3.75 percent of respondents. In the control group 75 percent of the respondents had the mean NSI of 324.35. Twenty percent of the respondents were having a mean Nutritional Status Index of 289.72 (Fig 8). The actual data is given in Appendix VI

Table 42 Difference of NSI between the Experimental group and Control group

Respondents (Group)	Mean	SD	t value
Experimental	315.705	24.496	-0.66*
Control	319.382	20.215	
Difference	-3.676	25.052	

\* 1 percent level

Table 42 shows that there is significant difference in experimental and control subjects at 1 % level.

#### 4.5 Stress Determinants of Respondents

Table 43 Stress levels of the respondents

Stress level [Score]	Experimental Group (n=80) Number	Control Group (n=20) Number
Low [12.436 - 17.43]	13 (16.25)	20 (100)
Mild [17.44 - 27.3]	62 (77.5)	-
High [ >= 27.4]	5 (6.25)	-

(Figures in parenthesis indicate percentage)

Table 43 depicts the fact that 77.5 percent in the experimental group had mild stress while 16.25 per cent had low stress where as 6.25 per cent had high stress. In the control group all the respondents had low stress.

### Correlation of stress with NSI

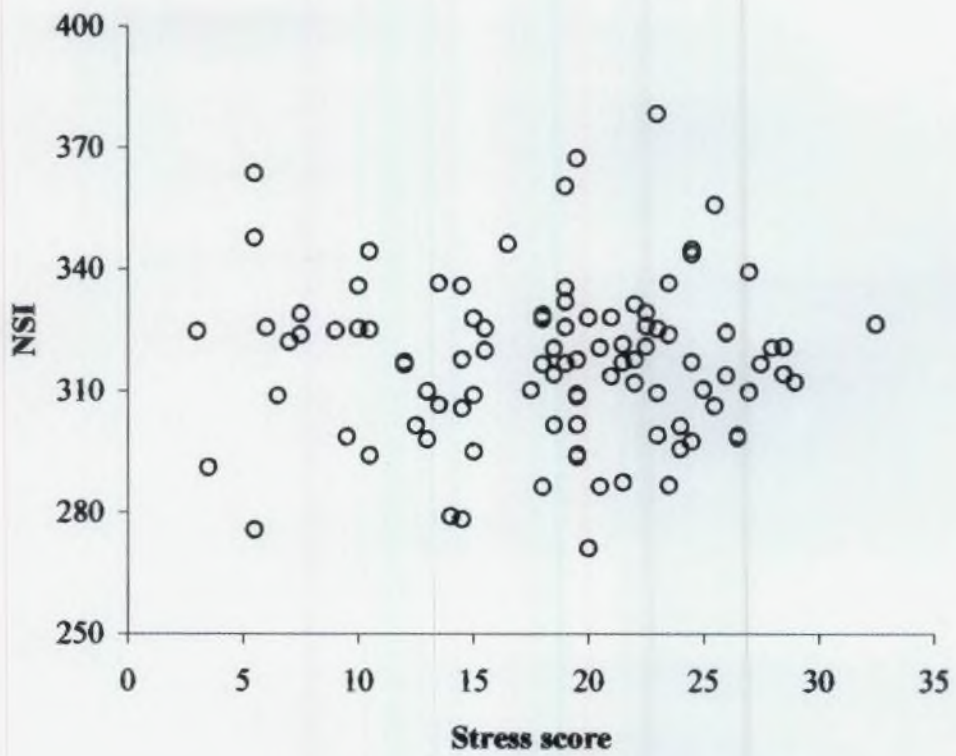
The Fig.9 relationship between NSI and stress score and it reveals that the high stress score had low NSI

Table44. Correlation of stress variables with NSI

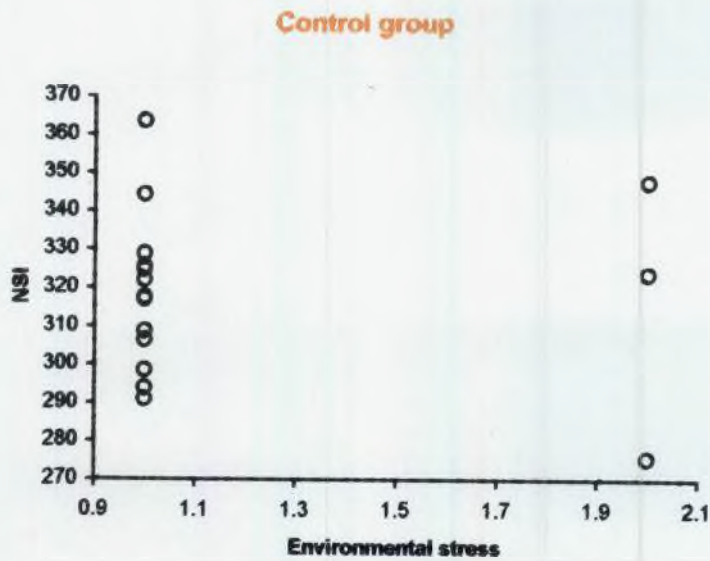
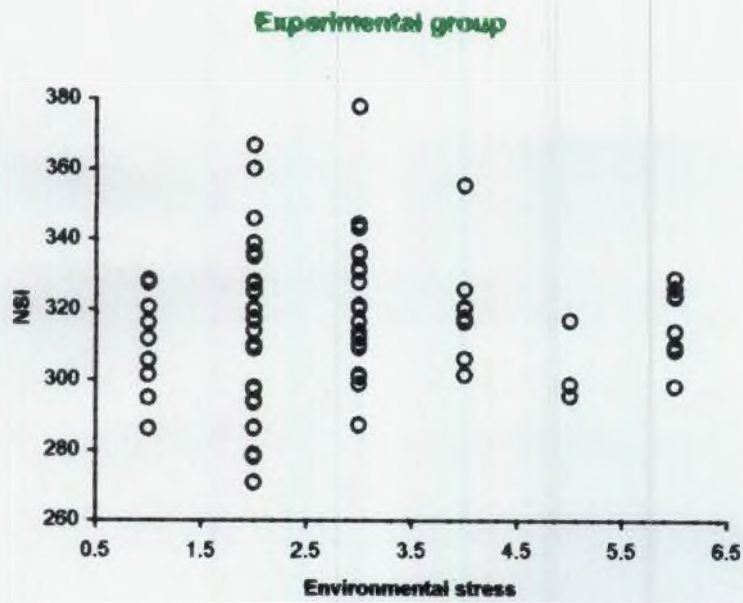
Respondents (Group)	Stress from environment (Mean Score)	Stress from personal relations & social activities (Mean Score)	Job stress (Mean Score)	Total stress score (Mean)	NSI (Mean)
Experimental	2.93 (+0.06)	7.119 (+0.01)	4.013 (+0.19)	20.844 (+0.09)	316.556
Control	1.15 (-0.08)	2.3 (-0.09)	3.675 (-0.13)	8.65 (-0.002)	319.382

(Figures in parenthesis indicate the 'r' value)

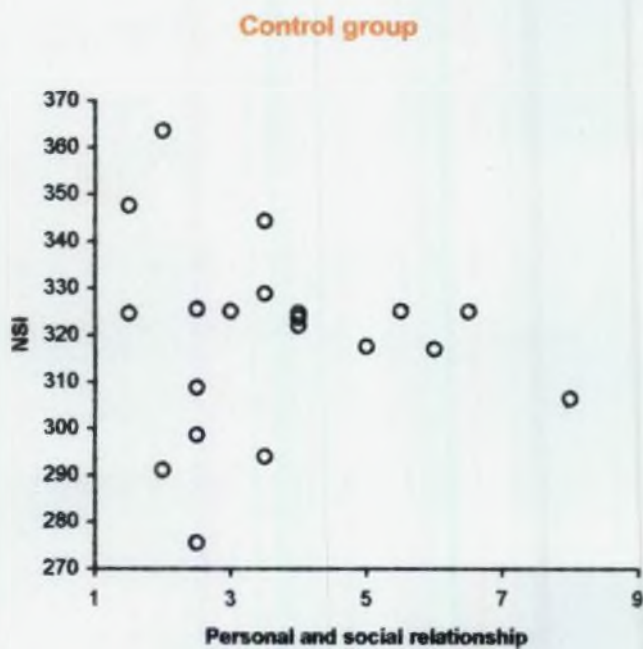
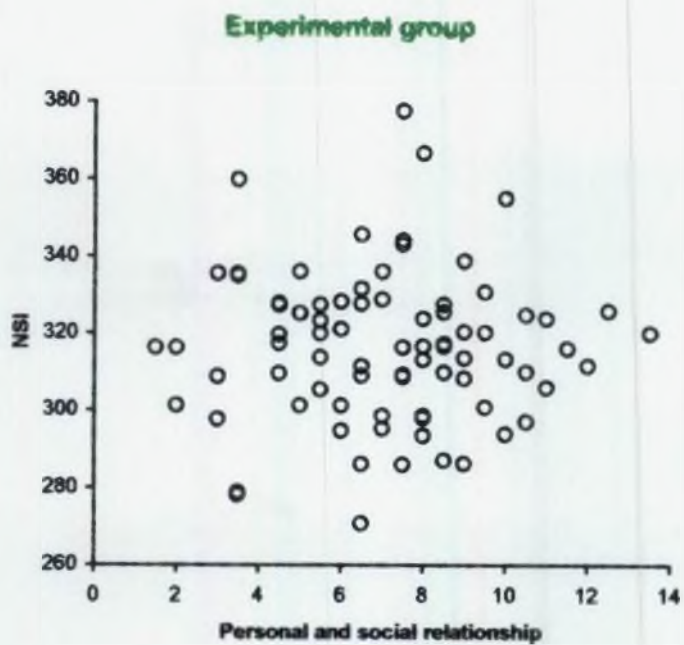
Table 44 and Fig. 10, 11 and 12 reveals that experimental group had higher stress when compared to the control group. The table reveals that stress from environment is related to the nutritional status of experimental group when compared to the control group and the positive 'r' value proves this relation. . There was a correlation between stress from personal and social activities and NSI of the experimental group ('r' value positive) while in the control group there is a negative relationship i.e. all the above variables are inversely proportional to the control group. There was a significant correlation obtained for job stress with NSI in the experimental group.



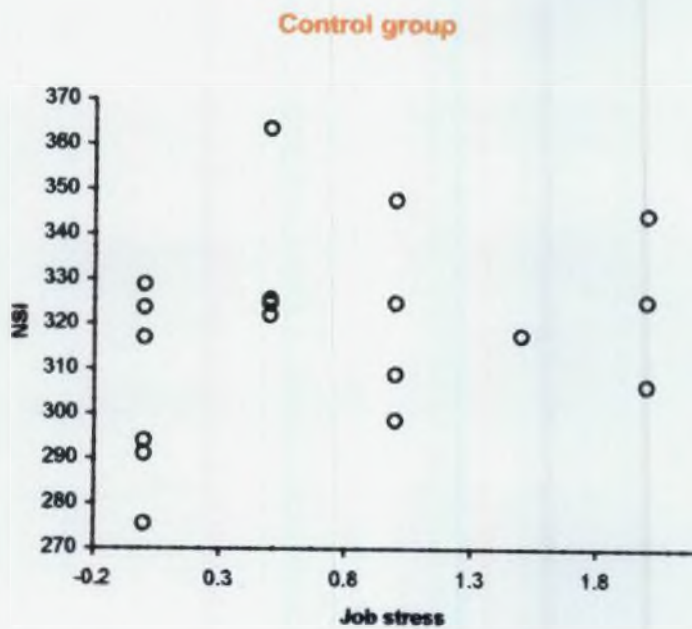
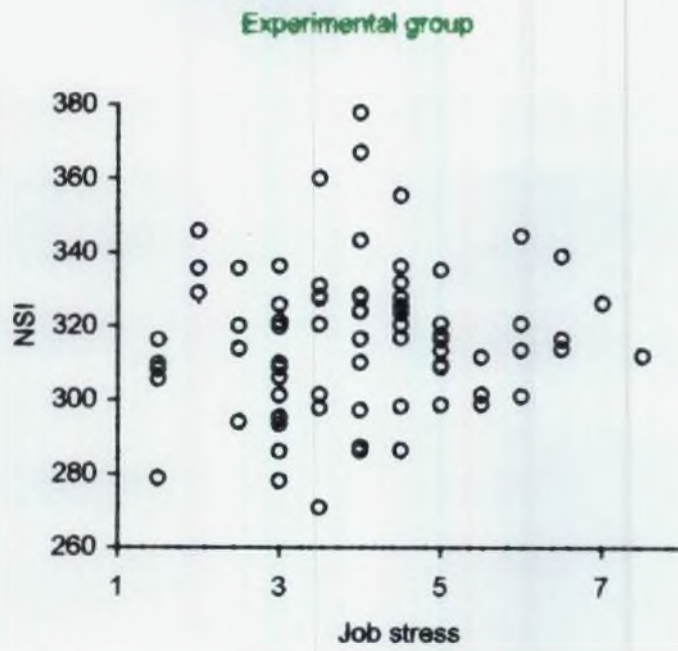
**Fig. 9. Relationship between NSI and stress score**



**Fig. 10. Relationship between NSI and environmental stress**



**Fig. 11. Relationship between NSI and personal and social relationship**



**Fig. 12. Relationship between NSI and job stress**



Table 45 Relationship of use of stressors in diet with NSI

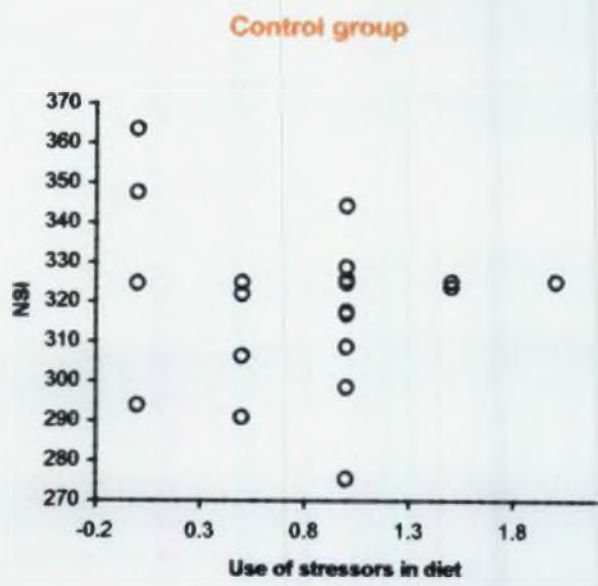
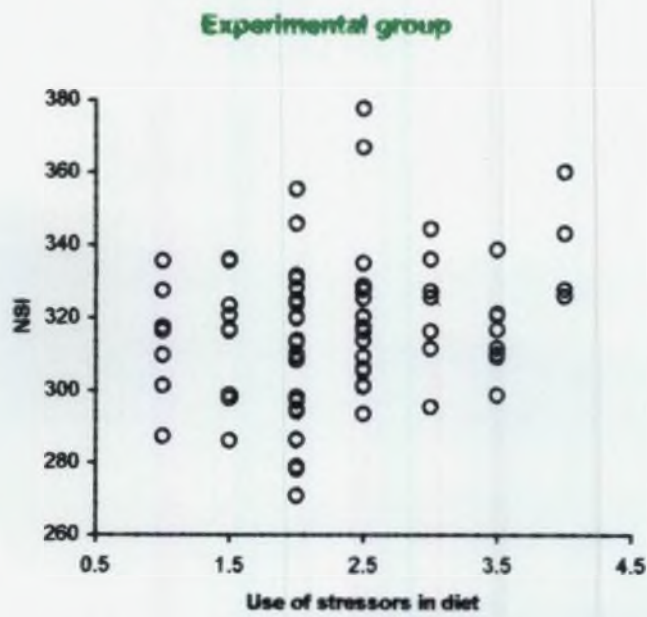
Respondents (Group)	Use of stressors in diet	r value	r static 95 % CI
Experimental	2.31	+0.26	+0.04 to +0.45
Control	0.8	-0.12	-0.53 to +0.34

Table 45 and Fig. 13 shows that the relationship between the use of stressors in diet with the NSI. The experimental group used more stressors in diet as they had more stress. There is positive correlation between the stressors in diet of the experimental group, which indicate that stressors in their diet are very much related with their stress ('r' value positive). The 'r' value of the control group shows that stressors in their diet are not related with their stress as the value of 'r' is negative i.e. the value is inversely proportional. It is also seen that experimental group have low NSI when compared to the control group.

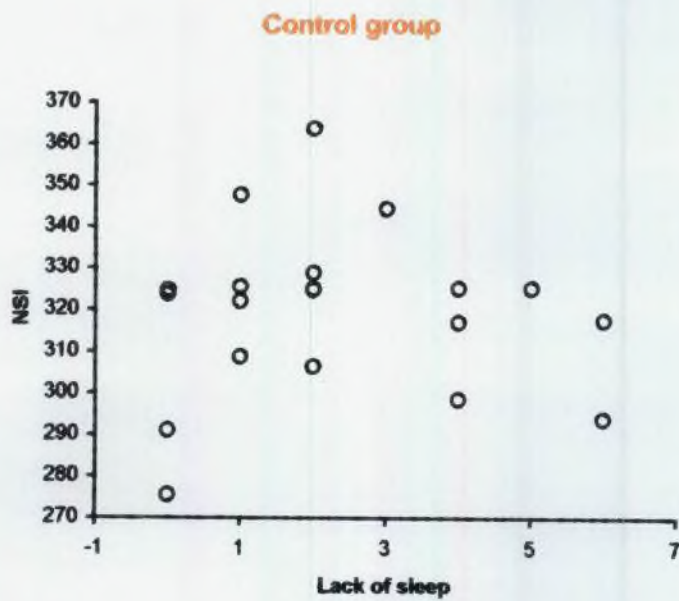
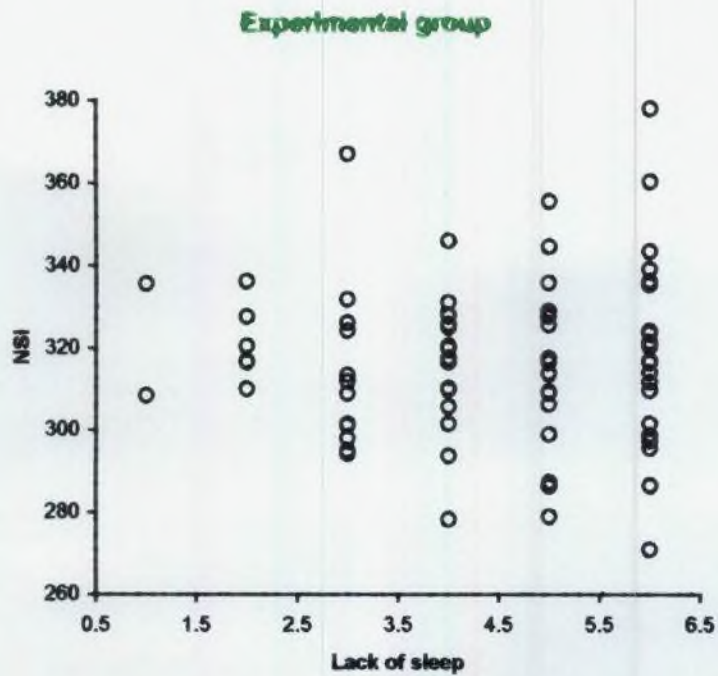
Table 46 Relationship between lack of sleep and NSI

Respondents (Group)	Mean Stress score	r value	r static 95 % CI
Experimental	4.48	-0.03	-0.25 to +0.19
Control	2.3	-0.01	-0.45 to +0.44

Table 46 and Fig. 14 shows that there is a negative correlation between lack of sleep due to stress with NSI in experimental group and in control group. The negative 'r' values indicate that the lack of sleep due to stress is very much related with NSI i.e. lack of sleep due to stress is found to lower nutritional status.



**Fig. 13. Relationship between NSI and use of stressors in diet**



**Fig. 14. Relationship between NSI and lack of sleep**

Table 47. Relationship between health problems and stress

Respondents (Group)	Mean Stress score	Health problem Mean	r value	r static 95 % CI
Experimental	20.844	6.96	+0.19	+0.87 to +0.95
Control	8.65	4.5	-0.17	-15.401 to +8.48

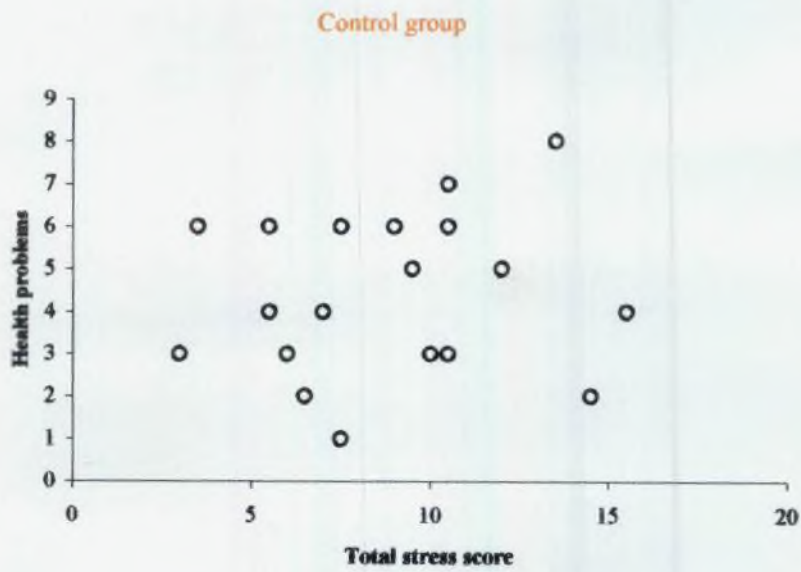
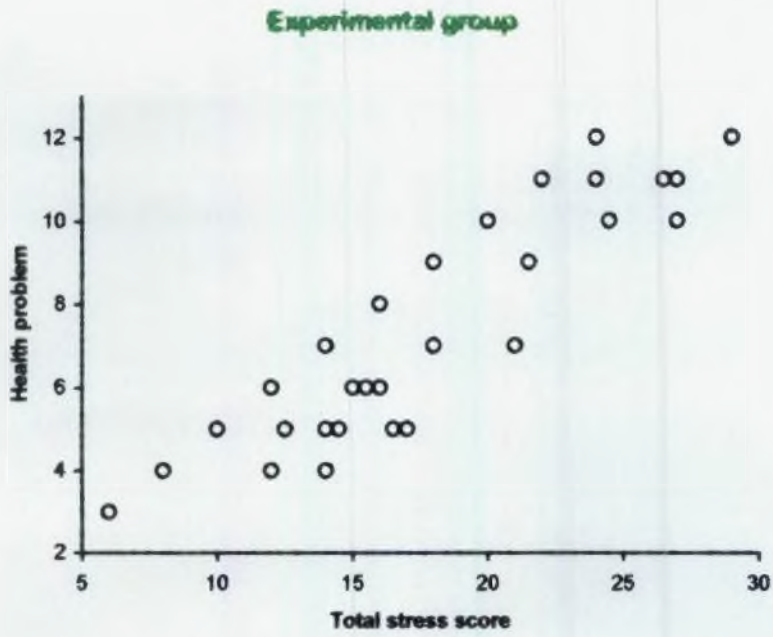
Table 47 and Fig. 15 shows that there is a relationship between stress scores and health problems. The experimental group had more stress and health problems when compared to the control group. Higher the stress score had more health problems. Here the 'r' value of the experimental group indicates that stress and health problems are positively correlated i.e. increase in health problem increase in stress.

Table 48. Relationship between health problem and job stress

Respondents (Group)	Mean Stress score	Health problem Mean	r value	r static 95 % CI
Experimental	4.012	6.96	+0.19	-0.12 to +0.32
Control	3.675	4.5	-0.13	-0.21 to +0.63

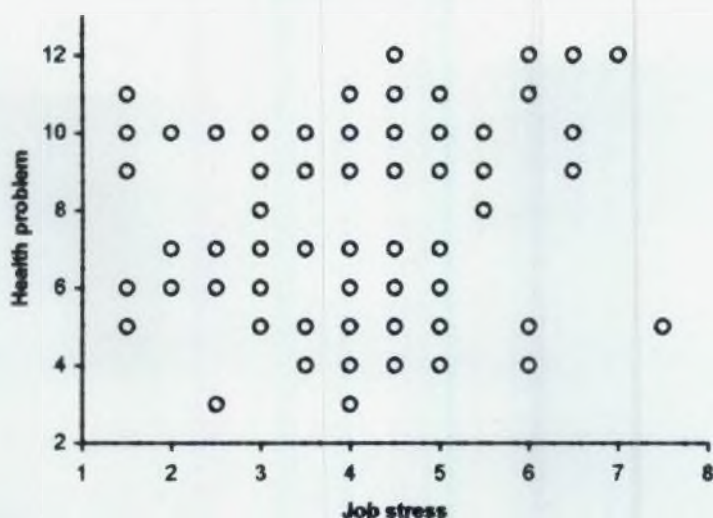
Table 48 and Fig. 16 reveals that there is significant relationship between the job stress and health problems of the respondents. The

experimental group had more job stress and they were more prone to health problems when compared to the control group. From the 'r' values it is clear that there is positive correlation between health problems and job stress of the experimental group and is also clear that there is no such correlation in control group.



**Fig. 15. Relationship between health problem and stress score**

Experimental group



Control group

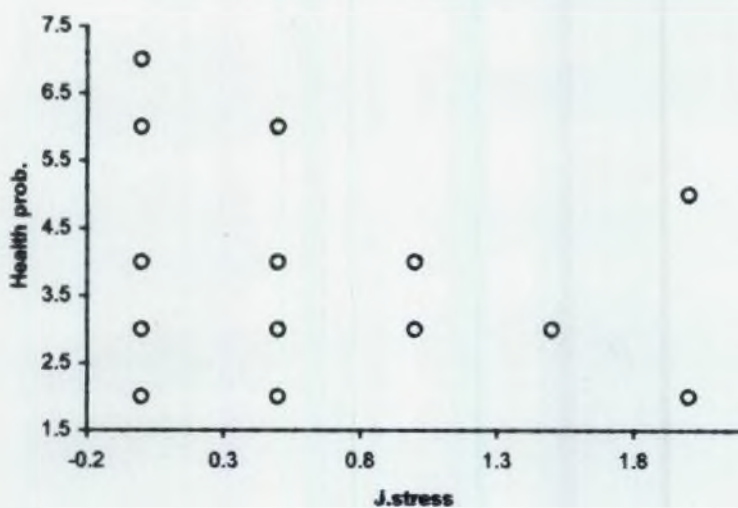


Fig. 16. Relationship between health problem and job stress

## *Discussion*



## 5. DISCUSSION

The results presented in the previous chapter are discussed in this section with relevant empirical evidence.

- 5.1. Socio-economic background of the respondents and families
- 5.2. Food consumption pattern of the respondents and families
- 5.3. Personal characteristics and work pattern of the respondents
- 5.4. Assessment of the nutritional status of the respondents
- 5.5. Stress determinants of the respondents

### 5.1 SOCIO-ECONOMIC BACKGROUND OF THE FAMILIES

The socio economic parameters adopted here comprises of the age, religion, caste and family details of the respondents. A recent research reveals that socio-economic factors play an important role in the food consumption pattern (Rahman and Rao, 2002). Besides age, information on few other common socio economic characteristics like religion, caste, family size, family type, education and employment status of the family, income level and its distribution, housing and domestic condition, may help in understanding the homogeneity and diversity in the socio-economic factors of the respondents.

On assessing the socio-economic background of the respondents, it was revealed that majority of respondents were Hindus and predominated by the under privileged groups. In the control group it was also found that 85 per cent of them were Hindus. This agrees with the earlier findings that

(Kannan *et al.*, 1997), Vishma (2000), Rekha (2001), Thara (2002), Krishnaroopaa (2003), and Sheela (2004).

With respect to the caste, majority of the plantation workers belonged to the SC/ST category.

In the experimental group 59 per cent were having nuclear families while 85 per cent in control group were from nuclear families. It is observed by many that the concept of nuclear family is becoming more and more common in our society and joint family system is fast disappearing. The present study also reveals the same. Similar reports are given by Shah and Rathore (1993), Karuna (1993), Lovely (1996), Razeena (2000), Vishma (2001) and Krishnaroopaa (2003) in their studies done in Thiruvananthapuram district.

Regarding the family size, Park (1997) had reported that average family size in India is four. In the present study also majority (80 per cent) of the experimental group belongs to small sized families with 1 to 4 members and also it could be seen that 16 per cent of the respondents have medium sized family with 5-6 members and only 4 per cent of the respondents, had 7-8 and above 8 members. While considering the control group all the respondents had small families. The finding of the study is in conformity with the studies reported by Rajagopal (1993), Park (1997), Kavitha (1999), Razeena (2000), Bulliyya *et al.* (2002), Krishnaroopaa (2003) and Shiny (2004).

Educational qualifications of the experimental group as well as control group indicated that they had high school level education. The findings of the present study are line With Resia and Sarngadharan (1994), Kavitha (1999) and Razeena (2000). In the study reported that Seshadrinath (1993) 22 per cent were illiterate and 36 per cent had studied up to primary level. Even though Kerala women are well educated, in

general, women with low education levels are found to be employed in informal sectors (Sumadivakar, 1999).

The employment status of the population is an important determining factor with respect to health and nutritional status as reported by Reddy *et al.* (1993).

In case of economic profile, it could be observed that 58 per cent of the families were from low income strata (2500-5000) 41.00 per cent belong to middle income (5000-7500) only 1.00 per cent are from high income strata (7500-10,000). The rubber plantation workers are permanent quasi government employees and that was the main reason for their stable family income.

While considering the work place the basic necessities like drinking water, latrine facilities etc are poor. The major problem faced by the women rubber plantation workers was lack of toilet facility. This study is in concurrence with that of Lovely (1996), Sumadivakar(1999) and Razeena (2000).

The monthly expenditure pattern of the families revealed that in most of the families the major expenditure was for food. Sixty one per cent of the respondents spent more than 1000 rupees for food materials. Similar result seen in the study of National Sample Survey (1994), Sumadivakar(1999), Bamji (1999), Razeena (2000), Rajni *and* Priti (2000) and Rekha (2001) .This finding is in concurrence with earlier findings reported by Sarvaekshana (1992) who reported that an average Indian spends major portion of his income on food. The expenditure for fuel, housing, recreations found to be very low. In the control group also the major expenditure was on food and the expenditure on fuel, housing, recreation found to be very low.

## 5.2 Food consumption pattern of the respondents and families

Robinson (1970) had opined that dietary habit of an individual in general influences his or her nutritional status. In the present study it was found that 92.5 per cent of the respondents (experimental group) studied are non-vegetarians. In control group all the surveyed respondents are non-vegetarians. Though most of them were branded as non-vegetarians, they include meat and egg occasionally in their diets but fish is a common constituent in their daily diet. Similar result was obtained by Karuna (1993) , Lovely (1996), Sumadivakar(1999), Beatrice (1999), Razeena (2000) and Rekha(2001).

On analyzing the frequency of use of various food items by the respondents (experimental group), it was obvious that cereals were the main item included daily in their diets. In addition to this, nuts and oil seeds, condiments and spices, fats and edible oil, sugar and jaggery etc. are the most perpetually used foods in the dietaries of all respondents. Similar results were obtained by Juna (1999) and Gayathri (2003) as these items are needed in small quantities daily for various culinary preparations popular in this region. Next to cereals milk, sugar and jaggery and fish were the items frequently used by them. Milk is used by the respondents only to prepare coffee and tea. This study agrees with earlier study reported by Kavitha (1999). Majority of the respondents consumed green leafy vegetables; roots and tubers occasionally. It was clear that cereals, coconut and spices and condiments were the items included mainly in their diet. Next to cereals milk, fats and sugar and jaggery were the items frequently included in respondents' diet. It was also found that fish was used daily by majority of the respondents. Similar projections were made in the studies of Sumadivakar (1999) and Razeena (2000). In this study it was clear that majority of both the groups were consumed fruits. A study

by Deshpandey et. al (2003) on 'dietary habits of farm women of Madhya Pradesh' found that a remarkable improvement in the consumption of green leafy vegetables and other seasonal fruits substantially.

On further enquiry about the distribution of money for the purchase of various food items, it was revealed that majority of the families allocated more money for the purchase of cereals followed by fish, and the vegetables and the amount spent for the purchase of green leafy vegetables, fruits, milk were found to be very low, and the purchase of these were very much dependent on their income. The result of this study is in agreement with that of National Nutrition Monitoring Bureau (1996), Sumadivakar (1999), Wadekar *et al.* (1999), Chopra *et al* (1999), Razeena (2000) and Krishnaroopaa (2003).

Meal frequencies revealed that majority of the respondents in the experimental group followed four meal-a-day pattern. While the majority of the respondents in the control group followed three meal-a-day pattern. Swaminathan (1986) has revealed that increasing frequency of meals in terms of size and number influences the work performance of the individual (Ukkuru 2001).

The results of food preference score revealed that a high preference score (above 90 per cent) was found on cereals, roots and tubers, nuts and oil seeds, spices and condiments, fats and oils, sugar and jaggery among the experimental and control group. The preference score for pulses, fruits, processed foods; green leafy vegetables were higher in control group when compared to the experimental group. In the experimental group meat and bakery items had a least preference score while in the control group low preference score was found on meat.

### **5.3. Personal characteristics and work pattern of the respondents**

On assessing the personal details of the respondents it was found that all respondents were in the age group of 25 to 55 years. Regarding the experience at work most of them were found to have an experience of 6 to 10 years.

Economic discomfort was found to be main reason for selection of job by all the respondents.

Forty five per cent of the respondents in the experimental group were found to be dissatisfied with their work mainly due to the health hazards and partly due to the meager wages (15 per cent) and heavy work load (40 per cent) Razeena (2000) who conducted a study on women working in a sewage farm in Thiruvananthapuram revealed that 35 per cent of them suffered from infectious diseases and skin diseases. Ukkuru (2001) also found that women workers engaged in stone breaking were dissatisfied with their occupation due to health hazards and low wages and long hours of work load. Rajalekshmi and Gayathri (2001) in their study reported that 90 per cent of the women employed in magnesite industry at Salem district were unhealthy even though they were maintaining their personal hygiene properly many problems were experienced by the respondents after the heavy peak load at the end of the day. Seventy six per cent of the women were having tiredness, irritation of the skin irritation and high blood pressure.

Jagadeeswaran (2001) in his study revealed that in power looms industry 40 per cent of them were expressed that they have back pain and leg pain due to continuous standing during the working hours. Less than one third of them stated that they were suffering from headache, asthma, chest pain and ear pain as they are working in worry and unsafe environment. A study conducted by Lovely (1996) among 200 coir workers revealed that 57 per cent of the respondents had a history of arthritis. Similar results were found in earlier studies done by Park and park (1991) and Jayasree (1994).

Majority of the women accessed their worksite by bus and reach their work site by walking, and they take more than 30 minutes to reach the work site. For 10 per cent their worksite is easily accessible as they are stayed within two furlong. The travel was found to be a constrain for them due to lack of transportation facility.

With regard to the work schedule of the respondents, it was noted that

they work for 9 hours a day. Nair (1990) and Ramgowda (1997) have reported that women work for longer hours and contribute substantially to the family income. Results showed that women dedicated 46.2 per cent of their time (11.1 hours per day) to economically productive activity, compared with an average men doing work for 8.1 hours per day. Including housework, women spent on an average 77.6 hours per week, compared to 57 hours per week by men (Edmunddson and Edmunddson, 1998). Women in agricultural communities work for longer hours compared to men (Samantha, 2005). When all forms of women's work are considered, women in the developing world work for longer hours per day than men (Jacobson, 1993 and Paolisso and Leslie 1995, Samantha, 2005). Meera et al.(1996) in their study in Muzaffirpur district in Bihar on farm women workers showed that they spent 14-18 hours of productive physical labour every day directly connected with agriculture allied and domestic chores.

They engaged 6 days in a week for plantation work. Wages were paid on the basis of their work out put. Majority of the respondent surveyed were not found to take any assistance in their job, 25 per cent of the respondent surveyed did not take any food items in between the work schedule and 63 per cent of the respondents who consumes food in between work hours.

#### **5.4 Assessment of Nutritional Status**

Nutritional status reflects the health of a person and is influenced by the quality of foods eaten and the ability of the body to utilize these foods to meet its needs (Gautam and Prathanavishwakarma, 2004).

The actual food intake by the respondents (experimental group) revealed that roots and tubers fish, fruits, met the RDA suggested by ICMR (1989). According to Srinivasan et al. (1991), the consumption levels of cereals, vegetables, pulses, milk and milk products and oils were very low among occupational groups viz., agricultural labourers and artisans. The food group, which was found to meet nearly the suggested RDA, was cereals. The food group, which met the RDA least, was other vegetables followed by fats and

oils, sugar and jaggery, green leafy vegetables and pulses. This study is in concurrence with that of Ukkuru (2001).

The actual food intake of the respondents (control group) revealed that milk, fish, fruits met the RDA suggested by ICMR (1989). The food group, which was found to meet nearly the suggested RDA, was cereals. Other vegetables, sugar and jaggery, roots and tubers, fats and oils, and pulses least followed the intake of green leafy vegetables. Karuna's (1993) observations on fisher women's diet s had revealed similar results.

Among the various nutrients, protein, calcium, retinol, riboflavin, niacin and vitamin C was found to meet adequately among the respondents (experimental group). The caloric intake was adequate. The nutrient intake of Iron was only 53.93 per cent and the thiamine was 76.36 per cent. A study on nutritional status of working women in Jaipur city also revealed that the mean nutrient intake was found to be significantly higher when compared with RDA(Jain and Singh , 2003).

In control group, the energy intake was adequate and protein, calcium, retinol, riboflavin, thiamine and niacin intake were found to meet the RDA. The Iron intake was low (57.9 per cent) and vitamin C intake was double when compared with the RDA.

(Even though, the second abundant metal in the earth's crust is iron, iron deficiency in infants, children and women still continues to be a global nutritional problem (Singh et. al, 1998; Walker, 1998; Devdas, 1999; Tiwari, 1999). Fifty five per cent of the women in the reproductive age group in India were suffering from some form of anaemia (Samantha, 2005). It has been estimated globally that about one half of all anaemia is due to iron deficiency (Schwartz and Thurnau, 1995).)

(As reported by Marx (1997) worldwide iron deficiency anaemia remains an enormous problem as more than 500 million people suffer from this condition. Devdas (1999) reported that in India 2 out of 3 women suffer from iron



deficiency anaemia. In India percentage of women with anaemia is 51.8 per cent and in Kerala, which is 22.6 per cent (State Resource Centre, 2005). The data revealed that although the intake of all the nutrients was higher than the RDA whereas the intake of iron was low. Agarwal (1991) pointed out that inadequate supply of nutrients like iron, folic acid and vitamin B12 causes nutritional anaemia characterized by reduced haemoglobin concentration. Kavitha (1999) in her study indicated that Thiruvananthapuram taluk had a highest prevalence of anaemia (52 per cent).

The results of the clinical examination of the respondents showed that most of them had occurrence of the anemia i.e. 67.5 per cent in experimental group and 45 per cent in the control group (Table 36). The results of a survey conducted in Hyderabad by Balakrishnan (1990) indicated that majority of the adult women are anaemic. When anaemia is common in poor class due to the non availability of healthy foods because of poverty; in higher class it is due to wrong food habits (Srilakshmi, 2003).

The nutritional status of the respondents was evaluated from their anthropometric measurements and clinical assessment. According to Beaton *et al.* (1990) anthropometry is useful because it provides strong and feasible predictors at individual level of subsequent ill health, functional impairment or mortality. Anthropometric measurements taken for assessing the nutritional status of the respondents revealed that the average weight for experimental group was 48.1 kg. The average height of the respondents was observed to be 149.5 cm. Similar results were noted in the study of Sumadivakar (1999).

According to Royston and Lopez (1987) BMI is of value in distinguishing the nutritional state of different groups, monitoring the adequacy of food and in specifying the proportion of malnourished in a population. WHO (1995) revealed that under nutrition is used as an indicator of current nutritional status. Experts from NIN (1999) confirm

that BMI value between 18.6 and 25.0 can be considered as comparable with health for both male and female. The hard labour performed by women in both within and out side home, may lead to a situation of chronic deficit calorie intake vis-à-vis their expenditure (Health profile of women South East Asia, 1996).

Body Mass Index of the experimental group revealed that 41per cent of the respondents belonged to the normal group and 23per cent were low weight, but considered as normal. Twenty one per cent suffered from mild –moderate forms of energy deficiency, only one per cent found that CED severe and 14 per cent were having overweight.

In the control group 35 per cent of the respondents were normal and 20 per cent having low weight. Severe; moderate and mild are 5 per cent each. According to Satyanarayana (1989) extremes of the BMI (undernourished and obese) are associated with low productivity in both men and women in industrial workers (Karuna 1993) and Monmi et al. (2000) in their study in tea industry revealed that the work performance and working capacity of women workers were very much affected by the workers with low BMI.

In control group (housewives) 30 per cent were having overweight and the percentage is comparatively higher than the experimental group. Jain and Singh (2003) in their study on sedentary workers found that they were expending lower levels of energy with higher intake of energy resulting in higher prevalence of obesity.

Waist hip ratio gives distribution of fat in the human body. A waist hip ratio greater than 1.0 in men 0.8 in women is indicative of android obesity and increases the risk of atherosclerosis (Srilakshmi, 2003).

In the experimental group 25 per cent of the respondents had below WHR and 7.5 per cent had WHR above than normal, while in the control group WHR found to be below the normal (30 per cent) and fifteen per cent had above normal.

A study was conducted on 100 women to assess the nutritional status of working women (25 – 50 years) in sedentary jobs ( 73 per cent) and WHR computed of the subjects that they were at risk of developed degenerative deceases (breathlessness, pain in joints, fatigue )according to WHR (Jain and Singh, 2003).

Apart from height and weight other anthropometric measurements of respondents BMI and MUAC were also evaluated. Majority of the respondents both experimental and control group were ranged between 24.1-28 cm. MUAC measurement helps to assess the amount of subcutaneous fat which in turn gives an indication of calorie reserves in the body of an individual (Malina *et al.*, 1974). In the control group the mean value is 26 cm. The mean value of MUAC showed that it is normal compared to the standard value indicating good nourishment.

Vitamin B complex deficiencies in the form of raw tongue and angular stomatitis were the clinical manifestations noted in the respondents under study. Vitamin C deficiency in the form of spongy and bleeding gums were observed in both the groups.

Reddy *et al.* (1993) reported that no state in India is free from iodine deficiency and many millions are considered to be at risk of IDD. Health Ministry (2000) found that 2000 million people are living at the high risk Iodine Deficiency Disorders in the country.

The prevalence of goiter in Kerala was found to be 20 per cent. More than 73 per cent of the patients were from rural areas and the affected populations were mainly in the prime stages of life with 16 per cent children up to 15 years, 60 per cent in the age group of 16 to 30 years and 18 per cent in the age group of 31 to 45 years (Prema, 1997) Thyroid enlargement could be noted on one per cent of

the respondents in the experimental group. Similar observation is noted in the study of Sheeja (2000).

Another clinical manifestation Dental caries noted in the experimental (36 per cent) and control group (30 per cent). The incidence of dental caries was reported to be high in Kerala (NNMB, 1984)The refined carbohydrate foods or use of sugars are associated with increased tendencies towards dental caries.(Jelliff,1966).

Energy balance is determined by the energy intake and energy expenditure. According to Poehlman and Horton (1990) storage of triglycerides in adipose tissue is dependent up on balance between energy expenditure and energy intake and the major factor explaining individual differences in energy expenditure is the variation in the level of physical activity. The body's energy reserves are regulated via the balance between energy intake and energy expended. The result revealed that 90 per cent of respondents (experimental group) had negative energy balance. In the control group it was 55 per cent. The result is concurrent with the findings of Sumadivakar (1999), Jain and Singh (2003).

Biochemical investigation was carried out for assessing the haemoglobin level of the respondents. The level of haemoglobin in the blood would help to assess whether the women are anaemic or not. Therefore haemoglobin estimation was done. Sixty eight per cent in the experimental group and 45 per cent in the control group indicated that, the haemoglobin level was below normal. Similar results were found among the women by Juna (1999) and Nirmala (2002).

#### **Assessment of stress and its relationship with nutritional status**

International Stress Management Association (1999) found that nearly 60 per cent of working adults have experienced great deal of fair amount of stress at work of these 40 per cent experienced a great deal of stress.

Global stress perceived by women at work place include psychological, physical work demands, job control, anticipation of job loss, assessment of work associates, fear of abuse, family functions and stressful life events and it is difficult for working women to manage and balance their responsibilities (Vimala *et al.*, 2004). Sharma (2000) stated that job stress is associated with back pain, coronary heart diseases, immune disorders, personal and family problems. He found that a combination of high demands and lack of control and support, contributes to absenteeism, mental strain, muscles and bone problems including repetitive strain injuries. In one survey 60 per cent of employed women cited stress as their number one problem at work. Levels of stress related illness are nearly twice as high for women as for men (Long and Khan.1995). A study by Ukkuru (2002) revealed that more than half of the employed women were found to suffer from employment related strain at medium to high levels.

As from the comparison of both the groups results in the relation between the stress and occupation of the women i.e., the experimental group at high stress when comparing to control group (Naik, 2000) in his study conducted on 105 workingwomen (lectures, factory working, nurses) and 75 housewives found differences in life stress. The studies revealed that workingwomen were in more stressful conditions than the house wives. Study done by Lovely (1996) among 200 respondents in coir industries found that, the women were engaged in the industry play a dual role of house wife as well as a wage earner and hence they are subjected to great stress and strain.

According to Swaminathan (1986) Nutritional status of an individual is the health status of the individual as influenced by the intake of essential nutrients. Nutritional status index developed for the respondents

indicated that, for majority of the respondents in experimental and control group, the NSI was 321.04 and 324.35 respectively. When comparing the nutritional status of experimental group with control group it was found that control group had a higher nutritional status.

The results of the present study reveals that experimental group *i.e.*, the working women had more stress when compared to the control group, the non-working women. It further shows the non-working women had low stress when the working women had mild and high stress.

The present study further shows that one of the major causative factors for stress is from job and personal relations and social activities for the working women. Environmental stress is less when compared to job stress is less when compared to job stress and stress from personal relations and social activities. Similar results have been obtained in several other studies. According to Eck and Wilson (2004) the body depletes its stores of nutrients when under stress, mainly protein and the B vitamins as well as vitamins C and A. A deficiency of magnesium, which helps muscles relax, has been linked to high-stress personalities. Under prolonged stress or are at risk for hypertension, one should consume foods high in potassium, such as orange juice, squash, potatoes, apricots, limes, bananas, avocados, tomatoes, and peaches.

One of the major finding of the study is that stress is one of the factors of low nutritional index. The study reveals that women those who had higher stress levels had lower NSI. In depression (which is a stress condition), a positive correlation between serum zinc and cofactor for synthesis of (n-3) fatty acids (Maes *et al.*, 1999). In a study 'micronutrient deficiency and stress' revealed that, there is a growing evidence that deficiency in (n-3) fatty acid is associated with depression, an important component of stress syndrome (Fava and Mischoulon, 2000).

Osmond (1996) found that poor nutrition was emerged as a very important component of the stress syndrome and that needs further characterization in the pathways for the risk of infection.

It is found that working women had more stress and they used more stressors like coffee, tea etc. in diet. The study also shows that the intake of stressors in diet has a relationship with their NSI. Women taking more stressors in their diet had lower nutritional status index when compared to those not lacking stressors. The study further shows that women who are under stress have insomnia (lack of sleep) and that there is relationship between insomnia and NSI.

Stress is one of the major causes for reducing the immune system and the present study shows that there is a relationship between stress and health. Women who are under high stress are having low health status.

# *Summary*



## 6. SUMMARY

In India, the demand for women labour outside the periphery of agriculture and handicrafts has been extremely limited. However, plantation industry created greater demand for women workers. The most important features of plantation industries is that female labour, constitute a significant part of plantation work. Women labour plays a significant role in enhancing overall productivity in plantation industry .As women continue to bear a brunt of hard labour, it is important to foster the concept of improving women's nutrition and health. Women's health and nutritional status is inextricably bound up with social, cultural and economic factors that influence all aspects of their lives. Outside employment taken up by women generally resulted in negligence of their own health. The study was designed with the following specific objectives.

- 1.To assess the nutritional status of the women workers
- 2.To assess the stress determinants of women workers.
- 3.To study the relationship between the stress and nutritional status of women workers.

The study was conducted in Pathanamthitta district as there were large rubber plantations in private and Government sectors and 36 percent of the women labour in Pathanamthitta is rubber plantation workers. Kodumon Group of Estates is purposively selected for the study.

Hundred families belonging to the defined area formed the study sample .The experimental group consisted of 80 women rubber plantation

workers and 20 women solely engaged in household activities were selected as control group.

The study focused on a number of factors, which might have contributed to the nutritional status, and stress of the respondents and these factors are highlighted below.

The socio economic and personal characteristics of working women indicated that most of the respondents were in the age group of 36-45 years. It was observed that the working as well as housewives surveyed mainly Hindus (SC and OBC) with high school level of education. Majority of the respondents were residing in nuclear families with family size of 4. Most of them belonged to 2 adult members family with 2 children. The families of the respondent having two employed person in a distribution of 1 casual worker and 1 regular worker.

On assessing the economic status of the families' majority of the families had a monthly income that ranged between Rs.2500 to 5000 mainly with per capita income of Rs. 500 to 1500.

Data collected on dietary pattern and food consumption pattern observed that most of them spent major part of their income for food ie. Rs.1000 to 2000. Among the expenditure on various food items most of them (working women) spent 10 to 20 percent on cereals, less than 8 percent on pulses. 2 to 4 percent of their income on roots and tubers. Less than 5 percent and less than 2 percent on green leafy vegetables, and for animal foods, fat and oils sugar and jaggery, 2 to 5 percent .Less than 4 percent on milk.

Data regarding food habits indicated that most of them are non-vegetarians .On assessing frequency of using different food items, most of

them used energy rich foods like cereals, roots and tubers, sugar and jaggery daily in their diet. Among the protein rich foods fish and milk (sufficient quantity) used daily, but pulses and meat were used occasionally in their diet. Most of them used mineral and vitamin rich foods like vegetables daily in their diet. Green leafy vegetables and fruits were used occasionally by most of the surveyed respondents. Considering the frequency score, cereals, fats and oils spices and condiments, sugar and jaggery and milk with high frequency score. On assessing the actual food intake it was noticed that roots and tubers, milk, fish and fruits were more than RDA and the other items were lower than RDA. In Working women the mean nutrient intake revealed that iron and thiamine intake was lower than the RDA while housewives iron and vitamin C was lower than the RDA. Data gathered on clinical examination indicated that most of the subjects surveyed were having iron deficiency anaemia. The biochemical assessment of haemoglobin level of the respondents also concatenate with this observation. Data on health problem indicated that most of them have job related problems are more. An enquiry about the NSI of working women 76.25 percent and 75 percent of housewives were with in the NSI range 300-350. The BMI of the working women also revealed that only 22.5 percent below the normal BMI while housewives only 15 percent reported lower BMI.

Data gathered on stress of the respondents revealed that working women have more stress than the housewives. Correlation of nutritional status with stress has revealed that stress is related to nutritional status. Higher stress score women had lower NSI. Working women used more stressors when compared with the housewives. The health problems related to work are highly related to stress in working women. The present study also shows that lack of sleep is related to lower nutritional status index.

Following conclusions can be made from the following study

1. While comparing the nutritional status of the working women with house wives the housewives had a higher nutritional status.
2. On comparison of nutritional status with stress it was revealed that working women have higher stress score ranging from mild to high whereas house wives has low stress scores.
3. Correlation of stress with NSI also revealed that stress is highly related to nutritional status. Women who had higher stress score had lower NSI.
4. Stress is highly related to health problems. The findings of the present study shows that women with higher stress scores have more health problems.

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# *Appendices*



## APPENDIX-I

### KERALA AGRICULTURAL UNIVERSITY

College of Agriculture ,Vellayani

Department of Home Science

Name of the investigator :

**Interview schedule to elicit information on socioeconomic environment from the respondent**

#### A1. PERSONAL AND SOCIOECONOMIC DETAILS

1.1 Name of the respondent :

1.2 Address:

1.3 Age :

1.4 Religion : Hindu/Christian/Muslim

1.5 Caste : Forward/SC/ST/OBC/OEC

1.6 Community :

#### B. FAMILY DETAILS

##### B.1 Composition of family

Sl No	Name	Relation to the respondent	Age	Sex	Educational Qualification	Occupation	Monthly income

#### C. ECONOMIC DETAILS

C.1 Total monthly income of the family :

C.2 Other sources of income :

1) Agriculture :

2) Domestic Animals :

3) Stitching :

4) Other subsidiary job :

### C.3 Monthly expenditure pattern of the respondent's family

Item	Average expenditure / month			
	Below 100/-	Between 100 – 500/-	Between 500 – 1000/-	Between 1000/- and above
Food				
Clothing				
Housing				
Travelling				
Education				
Entertaining				
Health care				
Saving				
Miscellaneous				

C.4 Details regarding savings                      Yes/No                      Actual                      Range

1. Post office

2. Bank

3. Co-operative Society

4. Chitty

5. Any other Specify:

C.5 Details regarding Indebtness                      Yes/No                      Actual                      Range

1. Bank

2. Monthly lenders

3. Co-operative Society

### E. DOMESTIC ENVIRONMENT

Infrastructure facilities

[Put (✓) at appropriate place]

E.1 Type of house

I	II	III	IV
House	Roof	Wall	Floor
Own	Thatched	Mud wall	Concrete
Rented	Tiled	Brick wall	Tiled
Quarters	Concrete	Stone wall	Mosaic
Any other	Sheet	Any other	Any other
Specify	Any other	Specify	Specify
	Specify		

E.2 Necessities available

Water	Light
Common well	Electricity
Own well	Solar
Municipality	Gobar gas
Common pipe	Kerosene
Any other specify	Any other specify

E.3 Latrines, drainage and waste disposal

Latrine present or not	Have latrines but no drainage Y/N	Have latrines as well as drainage Y/N	Waste disposal
			Own pith Common pith None Any other, specify

## APPENDIX-II

### KERALA AGRICULTURAL UNIVERSITY

College of Agriculture ,Vellayani

Department of Home Science

Name of the investigator :

#### Interview schedule to elicit information on dietary habits and food consumption pattern

I. Name of the respondent

Address :

Age :

#### A. FOOD HABITS

1. Vegetarian / Non vegetarian

2. Do you skip any meal ? : Yes / No

a) If yes, which meal? : Breakfast / Lunch /  
Evening tea /Supper

b) Why? :

3. Which meal do you believe that

must be consumed in greater amount ? : Breakfast / Lunch /  
Evening tea/ Supper

a) Why? :

4. What do you prefer? : Home food / Eating  
outside/ Both

5.How many times meals are taken in a day: Once/ Twice/Thrice/More than thrice

#### B. DAILY DIETARY PATTERN OF THE RESPONDENT

Meals	Menu	Quantity (g)	Ingredients	Time
Early morning				
Breakfast				
Mid morning				
Lunch				
Tea				
Dinner				
Bed time				

















## APPENDIX – II Continued

### D. Food Expenditure pattern

#### Interview schedule to elicit information on food expenditure pattern

Food group items	Daily	Weekly	Monthly	Quantity purchased	Amount spent
<b>Cereals</b>					
Rice					
Wheat					
Maida					
Atta					
Suji					
Ragi					
<b>Pulses</b>					
Bengal gram					
Bengalgram dhal					
Green gram					
Greengram dhal					
Redgram dhal					
Blackgram dhal					
Horse gram					
Cow pea					
Green peas					
Leafy vegetable					
Amaranthus-red					
Amaranthus-green					
Colocasia leaves					
Curry leaves					
Drumstick leaves					
Celery					
Agathi leaves					
Chekkurmanis					
Cabbage					

## APPENDIX – II Continued

### D.Food Expenditure pattern

Food group items	Daily	Weekly	Monthly	Quantity purchased	Amount spent
<b>Roots &amp; Tubers</b>					
Beetroot					
Carrot					
Colocasia					
Onion small					
Onion big					
<b>Sweet potato</b>					
Potato					
Tapioca					
Yam					
Any other					
Specify....					
<b>Other vegetables</b>					
Ash gourd					
Bittergourd					
Beans					
Cauliflower					
Cucumber					
Drumstick					
Jack, tender					
Ladies finger					
Mango green					
Onion stalk					
Papaya					
Pine apple					
Plum					
Pomegranate					
Sapota					
Tomato ripe					
Water melon					

## APPENDIX – II Continued

### D. Food Expenditure pattern

Food group items	Daily	Weekly	Monthly	Quantity purchased	Amount spent
<b>Fish &amp; other seafood</b>					
Sardine					
Oil sardine					
Mackeral					
Prawn					
Crab					
Ray					
<b>Meat and poultry</b>					
Beef					
Chicken					
Duck					
Pork					
Liver					
Egg, duck					
Egg, hen					
Mutton					
Milk, buffalo					
Milk, cow					
Milk goats					
Curd					
Butter milk					
Skimmed milk					
Skimmed milk Powder					
Whole milk Powder					
<b>Fats &amp; edible oil</b>					
Butter					
Ghee					
Oil					
Vanaspati					
Sugar					

## APPENDIX – II Continued

### D. Food Expenditure pattern

Food group items	Daily	Weekly	Monthly	Quantity purchased	Amount spent
<b>Snacks</b>					
Biscuit					
Cake					
Halwa					
Jilabi					
Ladoo					
Mysore pak					
Chips					
Pakoda					
Murukku					
Mixture					
Peda					
Vada					
Puffs					
Bonda					
Groundnut cake					
Gingelly ladoo					
Bread					
If any other, specify					
<b>Desserts</b>					
Fruit salad					
Ice cream					
Beverages					
Health drinks					

## Appendix-II Continued

Based on the frequency of use of various food items by the respondents, food use frequency scores were calculated as suggested by Reaburn et al.(1979)and the formula is given below.

$$\frac{\text{Percentage of Total Score}}{\text{Total Score}} = \frac{R_1S_1+R_2S_2 \text{ -----} R_nS_n}{n}$$

$S_n$  = Scale of rating

$R_n$  = Percentage of respondents selecting a rating

$n$  = Maximum scale rating



### APPENDIX-III

#### KERALA AGRICULTURAL UNIVERSITY

College of Agriculture ,Vellayani

Department of Home Science

Name of the investigator :

#### Individual dietary survey- 24 hour recall method

I. Name of the respondent

Address :

Age :

A)Foods taken from home

Types of food Preparation	Raw quantity of each ingredient (gm)	Total cooked amount (gm)	Individual intake (Cooked Volume) (gm)
1.			
2.			
3.			
4.			
5.			

B) Foods taken from outside

Types of food Preparation	Raw quantity of each ingredient (gm)	Total cooked amount (gm)	Individual intake (Cooked Volume) (gm)
1.			
2.			
3.			
4.			
5.			

## APPENDIX-IV

### KERALA AGRICULTURAL UNIVERSITY

College of Agriculture ,Vellayani

Department of Home Science

Name of the investigator :

#### Schedule to assess anthropometric ,biochemical & clinical assessment of the respondent

I. Name of the respondent

Address :

Age :

#### II A ANTHROPOMETRIC MEASUREMENT

Height (cm)	
Weight (kg)	
Mid upper arm circumference (cm)	
Waist (cm)	
Hip (cm)	

#### B. CLINICAL SYMPTOMS

Symptoms	Severe	Moderate	Mild	Nil	Remarks
1. Hair					
a) Lack lusture					
b) Dispigmentation					
c) Thinness & sparseness					
d) Flag sign					
e) Easy pluckability					
2. Face					
a) Emaciated					
b) Oedema					
3. Lips					
a) Angular stomatitis					
b) Chelosis					
4. Eyes					
a) Bitots spot					
b) Conjunctival xerosis					
c) Keratomalacia					

**APPENDIX – IV Continued**

<p>5. Tongue</p> <ul style="list-style-type: none"><li>a) Oedema</li><li>b) Scarlet &amp; raw tongue</li><li>c) Magenta tongue</li><li>d) Atrophic papillae</li></ul> <p>6. Teeth</p> <ul style="list-style-type: none"><li>a) Mottled enamel</li></ul> <p>7. Gums</p> <ul style="list-style-type: none"><li>a) Spongy bleeding</li></ul> <p>8. Glands</p> <ul style="list-style-type: none"><li>a) Thyroid enlargement</li><li>b) Parotid enlargement</li></ul> <p>9. Skins</p> <ul style="list-style-type: none"><li>a) Sclerosis</li><li>b) Pellagrous dermatitis</li><li>c) Crazy pavement dermatitis</li><li>d) Scrotal &amp; vulval dermatitis</li></ul> <p>10. General</p> <ul style="list-style-type: none"><li>a) Anaemia</li><li>b) Beading of ribs</li><li>c) Enlargement of spleen</li><li>d) Enlargement of liver</li></ul>					
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## APPENDIX-V

### ESTIMATION OF HAEMOGLOBIN (Cyanmethaemoglobin Method)

#### Principle

Haemoglobin is converted into Cyanmethhaemoglobin by the addition of KCN and ferric cyanide. The colour of Cyanmethhaemoglobin is read in a photocolorimeter against a standard solution. Since cyanide has the maximum affinity for haemoglobin, this method estimates the total haemoglobin.

#### Procedure

The procedure for estimation of haemoglobin is by taking 20  $\mu$ l of blood measured accurately from a haemoglobin pipette and delivered on to Whatman No.1 filter paper of size 2 x 4 cm. The filter paper is then air dried and labeled. This can be stored up to one week. The portion of filter paper containing the blood is cut and dipped in 5 ml of Drabkin's solution taken in a test tube. Wait for 30 minutes, mix the contents and take the reading at 540 nm of unknown sample and that of standard of known haemoglobin content against a reagent blank (Raghuramulu *et al.*, 2003). This procedure was followed here in the haemoglobin estimation of the control group reading obtained was tabulated.

## Appendix-V Continued

### Haemoglobin level of the respondents

Experimental Group				Control Group	
Sl.No.	Hb	Sl.No.	Hb	Sl.No.	Hb
1	11	41	10	1	11.5
2	9.2	42	13.5	2	12.3
3	10	43	12.4	3	10.7
4	9	44	10.5	4	10.5
5	9.8	45	10	5	12.8
6	12.5	46	9.2	6	12.1
7	11.5	47	12.5	7	13
8	12.4	48	10.2	8	12
9	8.5	49	12	9	11.9
10	12.3	50	13	10	10
11	9.4	51	9.8	11	11.9
12	10.1	52	11.5	12	12.4
13	10	53	10.3	13	14
14	11.5	54	10.2	14	11.1
15	10.3	55	10	15	10.9
16	12.3	56	10.2	16	13.3
17	10.2	57	10	17	13.1
18	11	58	12.5	18	12.3
19	10	59	10	19	11.9
20	12	60	10.7	20	12.5
21	12.2	61	8.5		
22	14.5	62	9		
23	12.4	63	12.4		
24	12	64	11		
25	11	65	12.2		
26	9.8	66	11		
27	8	67	13.8		
28	11.3	68	12.4		
29	9	69	10		
30	10.2	70	10.2		
31	9.8	71	12.1		
32	13	72	10		
33	8	73	8.3		
34	12.4	74	10		
35	10.7	75	5.5		
36	13.8	76	10.2		
37	8.5	77	12		
38	12	78	12.5		
39	10.2	79	8.5		
40	9	80	10.5		

## Appendix-VI

### Nutritional status Index of the respondents

Experimental Group				Control Group	
Sl.No.	NSI	Sl.No.	NSI	Sl.No.	NSI
1	320.47	41	327.35	1	316.93
2	286.04	42	325.59	2	324.69
3	293.99	43	317.34	3	293.86
4	270.87	44	298.1	4	308.72
5	286.18	45	320.06	5	317.47
6	377.66	46	293.47	6	328.8
7	321.04	47	325.3	7	325.04
8	309.99	48	335.57	8	325.04
9	311.71	49	309.68	9	290.97
10	336.02	50	309.92	10	323.66
11	319.72	51	308.73	11	344.17
12	316.3	52	335.54	12	298.53
13	327.5	53	335.03	13	321.91
14	328.26	54	327.6	14	275.53
15	301.34	55	297.76	15	324.62
16	355.25	56	301.29	16	363.5
17	309.11	57	278.8	17	325.47
18	331.6	58	325.89	18	347.54
19	316.27	59	308.79	19	324.88
20	294.79	60	286.38	20	306.31
21	317.36	61	297.18		
22	344.3	62	300.94		
23	298.62	63	313.75		
24	366.79	64	343.1		
25	313.38	65	298.71		
26	320.14	66	316.7		
27	311.52	67	316.7		
28	309.33	68	313.26		
29	323.38	69	327.72		
30	323.93	70	320.45		
31	316.18	71	324.81		
32	313.68	72	301.27		
33	308.31	73	330.84		
34	328.83	74	338.78		
35	305.47	75	359.96		
36	295.34	76	327.84		
37	278.1	77	336.13		
38	305.94	78	287.16		
39	316.38	79	345.8		
40	323.82	80	320.29		

## APPENDIX – VII

### KERALA AGRICULTURAL UNIVERSITY COLLEGE OF AGRICULTURE, VELLAYANI DEPARTMENT OF HOME SCIENCE

#### Assessment of stress of respondents

Name & Address :

Age:

---

Read each sentence given below and circle whichever is appropriate for you

A) Stands for False/Never

B) Stands for sometimes true

C) Stands for always true

- |    |  |   |   |   |
|----|--|---|---|---|
| 1  | I get less than 7 hours of sleep per day                           | A | B | C |
| 2  | I relax only when I sleep  | A | B | C |
| 3  | I feel sleepy during the day time                                  | A | B | C |
| 4  | I seldom get time to visit my friends                              | A | B | C |
| 5  | I don't get time for enjoyable activities                          | A | B | C |
| 6  | I rarely engage something for fun                                  | A | B | C |
| 7  | I listen to music to enhance relaxation                            | A | B | C |
| 8  | I live in a climate that is uncomfortable for me                   | A | B | C |
| 9  | I live in a polluted area  | A | B | C |
| 10 | I am exposed to other people's cigarette smoke                     | A | B | C |
| 11 | I work more than 8 hours per day                                   | A | B | C |
| 12 | I am not interested at work  | A | B | C |
| 13 | I feel overworked  | A | B | C |
| 14 | I have conflicts with my boss and coworkers                        | A | B | C |
| 15 | I do more than one job   | A | B | C |
| 16 | I don't more than one job  | A | B | C |
| 17 | I don't get satisfaction at my work                                | A | B | C |
| 18 | I feel bored at my work  | A | B | C |
| 19 | I feel like eating sugar, whenever I am tired                      | A | B | C |
| 20 | I feel like drinking more than two cups of coffee or tea every day | A | B | C |
| 21 | I like to eat salty and fried foods                                | A | B | C |
| 22 | I get hurt at the behaviour of family members                      | A | B | C |

- |    |   |   |   |   |
|----|---|---|---|---|
| 23 | I often argue with my spouse  | A | B | C |
| 24 | I am disturbed with the change in financial state                   | A | B | C |
| 25 | Whatever I do I want it to be perfect                               | A | B | C |
| 26 | I always hard on myself and feel I could have done better           | A | B | C |
| 27 | I take on works more than what I do                                 | A | B | C |
| 28 | I think I am a constant worrier                                     | A | B | C |
| 29 | I worry about what people would think of me                         | A | B | C |
| 30 | I feel I am not getting proper care and attention which is required | A | B | C |
| 31 | I feel left out and alone   | A | B | C |
| 32 | I am not getting time for myself                                    | A | B | C |
| 33 | I find it difficult to speak up about something that annoys me      | A | B | C |
| 34 | I cannot take criticism   | A | B | C |
| 35 | My husband is not co-operative                                      | A | B | C |



## **Appendix-VII Continued**

### **Assessment of stress of respondents**

Norman Shealy's stress scale (Modified)

Total Score obtained = 68.4

Stress scale for High stress = 27.4

Stress scale for Mid Stress = 17.44

Stress scale for Low Stress = 12.436

## Appendix-VIII

### Energy Balance of the respondents

Experimental Group		Control Group			
Sl.No.	Energy Balance(Kcal)	Sl.No.	Energy Balance(Kcal)	Sl.No.	Energy Balance(Kcal)
1	-163.46	41	-300.6	1	-131.56
2	-221.01	42	177.489	2	-70.776
3	-151.69	43	-304.32	3	-470.37
4	-261.29	44	-227.68	4	-156.47
5	-442.57	45	-525.7	5	-292.73
6	318.583	46	-196.3	6	250.08
7	185.8	47	-205.58	7	-452.67
8	-61.143	48	531.723	8	34.735
9	71.5583	49	-415.2	9	-73.645
10	-481.92	50	-418.48	10	-236.95
11	57.5108	51	-555.31	11	466.229
12	39.9252	52	-466.27	12	-208.02
13	-273.5	53	-393.36	13	-26.551
14	2.42317	54	-91.427	14	-432.47
15	2.51542	55	223.253	15	569.01
16	357.803	56	-468.52	16	255.14
17	253.267	57	-633.37	17	56.374
18	-258.34	58	474.331	18	311.86
19	-513.2	59	-476.16	19	282.374
20	139.508	60	-535.3	20	269.745
21	208.963	61	-353.37		
22	-406.7	62	77.3867		
23	-517.37	63	-318.39		
24	567.954	64	42.559		
25	-91.134	65	339.053		
26	-388.89	66	244.233		
27	-459.23	67	-538.69		
28	-205.04	68	388.525		
29	-485.33	69	-387.98		
30	-131.27	70	-261.77		
31	-185.39	71	305.646		
32	-342.24	72	252.115		
33	271.092	73	-211.49		
34	218.3	74	-28.792		
35	-479.47	75	319.32		
36	-462.53	76	365.681		
37	-315.58	77	687.753		
38	-621.69	78	232.898		
39	-104.3	79	132.854		
40	302.348	80	-228.15		

## APPENDIX –IX

### KERALA AGRICULTURAL UNIVERSITY COLLEGE OF AGRICULTURE, VELLAYANI DEPARTMENT OF HOME SCIENCE

Nutritional Status and stress determinants of women workers in rubber plantations

#### **Prediction equation for determining the energy expenditure pattern of the respondent**

Energy expenditure = Basal Metabolic Rate (BMR)  
Factor x BMR

BMR Factor recommended by ICMR\* for  
adult women engaged in moderate activity = 1.9

BMR Factor recommended by ICMR\* for  
adult women engaged in sedentary activity = 1.0

BMR suggested by ICMR expert group for  
Indian adult female (Age 18-30) =  $14.0 \times \text{Body weight (kg)}$   
+ 471

BMR suggested by ICMR expert group for  
Indian adult female (Age 30-60) =  $8.3 \times \text{Body weight (kg)}$   
+ 788

\*ICMR (1989)

## APPENDIX - IX Continued

### Total energy expenditure of the respondents

Sl. No.	Total energy expenditure (Kcal)	Sl. No.	Total energy expenditure (Kcal)
1	2170.95	41	2228.03
2	2347.05	42	2406.34
3	2466.15	43	2311.21
4	2308.31	44	2615.22
5	2377.39	45	2277.94
6	2664.9	46	2496.23
7	2619.29	47	2543.72
8	2582.72	48	2369.82
9	1889.97	49	2269.11
10	2544.09	50	2165.36
11	2195.18	51	2376.24
12	2299.34	52	2296
13	2251.64	53	2410.2
14	2477.55	54	2244.67
15	2342.27	55	2461.14
16	2523.48	56	2299.34
17	2568.36	57	2476.61
18	2308.31	58	2474.91
19	2394.38	59	2282.67
20	2325.31	60	2459.28
21	2427.18	61	2394.75
22	2377.39	62	2186.34
23	2444.16	63	2342.67
24	2823.47	64	2653.32
25	2560.72	65	2427.18
26	2483.17	66	2566.05
27	2273.22	67	2344.47
28	2381.08	68	2483.17
29	2432.12	69	2336.21
30	2344.6	70	2359.26
31	2308.31	71	2394.38
32	2344.47	72	2416.03
33	2649.39	73	2244.67
34	2568.24	74	2446.83
35	2449.36	75	2563.02
36	2464.19	76	2156.23
37	2244.67	77	2295.73
38	2528.78	78	2446.83
39	2382.69	79	2563.02
40	2776.69	80	2198

## APPENDIX - X

### HEIGHT and WEIGHT of the respondents

Experimental Group						Control Group		
Sl. No.	Height cm	Weight Kg	Sl. No.	Height cm	Weight Kg	Sl. No.	Height cm	Weight Kg
1	145	42	41	152.4	39	1	150	46
2	146	43	42	152.5	59	2	144	40
3	150.1	50	43	145.8	44	3	156	39
4	148	41	44	150.5	56	4	147	33
5	150	42	45	145	42	5	165	55
6	155	62	46	151	50	6	158.5	65
7	152	59	47	150	49	7	147	43.5
8	162	60	48	148	57	8	145	47
9	147	35	49	146.3	44	9	152.5	50
10	168	58	50	147.7	39	10	148	39
11	152.5	43	51	151	45	11	148	72
12	150	43	52	148	40	12	160	50
13	150	43	53	162	47	13	163	62
14	159	54	54	143.5	40	14	150	44
15	154	43	55	149	50	15	145	56
16	150	63	56	150	43	16	148.5	74
17	152	53	57	158.2	48	17	159	66
18	149.5	41	58	147.5	57	18	149	55
19	159.5	49	59	147	42	19	143	50
20	133	39	60	155.2	47	20	148	51
21	147	48	61	163	43			
22	149	42	62	130	39			
23	153	49	63	141	40			
24	144.2	71	64	162.5	61			
25	150.5	59	65	147	48			
26	151.2	51	66	159.9	59			
27	148	36	67	153.5	46			
28	151.3	45	68	145	51			
29	156.5	48	69	154	37			
30	154.3	49	70	140	44			
31	146.5	41	71	141	49			
32	158.3	46	72	150	50			
33	155.8	64	73	145	40			
34	150	56	74	140	46			
35	154.9	52	75	142	56			
36	156.3	47	76	141.7	43			
37	150	40	77	145.4	46			
38	153.5	49	78	142.5	46			
39	156.2	48	79	153	56			
40	157.5	65	80	154.2	40			

## APPENDIX - X Continued

### BMI, WHR and MUAC of the respondents

Experimental Group								Control Group			
Sl. No.	BMI	WHR	MUAC (cm)	Sl. No.	BMI	WHR	MUAC (cm)	Sl. No.	BMI	WHR	MUAC
1	19.98	0.84	22	41	16.79	0.86	21	1	20	0.83	24
2	20.17	0.75	22	42	25.36	0.85	29	2	19.2	0.85	25
3	22.22	0.77	24	43	20.69	0.83	27	3	16.03	0.77	22
4	18.71	0.71	21	44	24.72	0.78	27.5	4	15.27	0.81	22
5	18.66	0.75	23	45	19.9	0.84	23.7	5	20.2	0.83	30
6	25.8	0.99	28	46	19.24	0.77	26	6	25.87	0.86	30
7	25.55	0.84	25	47	27.17	0.85	23	7	20.13	0.85	27
8	22.86	0.81	27	48	26.6	0.88	24.5	8	22.35	0.87	26
9	16.19	0.82	20	49	20.56	0.81	23	9	21.49	0.76	27
10	20.54	0.88	25	50	18.05	0.81	21	10	17.8	0.85	24
11	18.48	0.84	24	51	19.74	0.81	23	11	32.87	0.9	33
12	19.11	0.83	25	52	18.26	0.88	22	12	19.53	0.78	24
13	19.11	0.86	28	53	17.91	0.88	19	13	23.35	0.84	26
14	21.35	0.86	27	54	19.42	0.86	22.5	14	19.55	0.72	20
15	18.13	0.79	22	55	22.52	0.78	24	15	26.63	0.85	31
16	28	0.93	29	56	18.13	0.79	21	16	33.35	0.95	34
17	22.93	0.81	26	57	19.18	0.73	23.5	17	26.1	0.85	29
18	18.34	0.87	23	58	36.09	0.85	34	18	24.77	0.91	27
19	19.26	0.83	25	59	19.44	0.81	25.5	19	24.45	0.85	28
20	22.04	0.77	27	60	16.18	0.75	22	20	23.28	0.8	25
21	22.21	0.83	25	61	23.07	0.78	24				
22	18.91	0.9	23	62	20.11	0.79	22				
23	20.93	0.78	23	63	23.1	0.82	26				
24	34.4	0.96	30	64	22.21	0.9	26.5				
25	26.04	0.82	27.5	65	23.33	0.78	26.5				
26	22.3	0.84	22.5	66	19.52	0.83	24				
27	16.44	0.82	19.2	67	24.43	0.86	26				
28	19.66	0.81	22.5	68	15.6	0.82	22				
29	19.6	0.85	24	69	22.45	0.86	30				
30	20.58	0.85	24	70	24.64	0.84	25.5				
31	19.1	0.83	23	71	22.22	0.85	23				
32	18.36	0.82	21.5	72	19.02	0.79	22				
33	24.37	0.81	29	73	23.47	0.87	25				
34	24.49	0.86	28	74	19.7	0.89	23				
35	21.67	0.8	24	75	27.77	0.95	24				
36	19.24	0.77	23	76	22.95	0.86	24				
37	17.77	0.73	22	77	23.92	0.88	26				
38	20.79	0.8	23	78	16.82	0.75	23				
39	19.67	0.83	23	79	21.76	0.91	23				
40	26.2	0.85	27.5	80	20.37	0.84	23				

## APPENDIX-XI

### KERALA AGRICULTURAL UNIVERSITY

College of Agriculture ,Vellayani

Department of Home Science

Name of the investigator :

**Schedule to collect information on the respondent's time expenditure pattern**

I. Name of the respondent

Address :

Age :

No.	Activity	Time	
		From	To (hours/ minutes)
1	Wake up		
	Sleep		

**APPENDIX -XII**

**KERALA AGRICULTURAL UNIVERSITY  
COLLEGE OF AGRICULTURE, VELLAYANI  
DEPARTMENT OF HOME SCIENCE**

**Health problems related to work**

		Always	Sometimes	Never
1	Chronic worries			
2	Nervousness			
3	High blood pressure			
4	Digestive problems			
5	Emotional instability			
6	Feeling inability to cope			
7	Uncoperative attitude			
8	Excessive use of drugs/ alcohols/smokes			
9	Inability to relax			
10	Frequent headache			
11	Skin irritation			
12	Muscle pain			
13	Frequent urination			
14	Heart problem			
15	Breathing problem			
16	Anxiety			
17	Anger			
18	Tension			
19	Frustration			
20	Fatigue			



## Appendix-XII Continued

### Systolic and Diastolic pressure of the respondents

Experimental Group			Control Group					
Sl.No.	BP-s	BP-d	Sl.No.	BP-s	BP-d	Sl.No.	BP-s	BP-d
1	130	80	41	120	60	1	130	80
2	110	70	42	100	60	2	110	70
3	100	70	43	110	70	3	110	60
4	110	70	44	130	80	4	130	80
5	100	60	45	120	70	5	120	80
6	130	80	46	130	80	6	110	70
7	120	70	47	110	70	7	120	70
8	120	80	48	130	80	8	120	60
9	130	80	49	140	90	9	110	60
10	110	70	50	120	60	10	120	60
11	120	70	51	120	80	11	130	90
12	120	60	52	110	80	12	100	60
13	110	60	53	110	70	13	120	80
14	120	60	54	110	70	14	130	70
15	130	80	55	120	70	15	110	70
16	100	60	56	100	70	16	130	80
17	120	80	57	110	70	17	110	70
18	130	70	58	120	80	18	100	60
19	110	70	59	130	80	19	120	70
20	130	80	60	120	70	20	130	80
21	110	70	61	120	80			
22	100	60	62	130	80			
23	120	70	63	120	70			
24	130	80	64	110	80			
25	110	70	65	120	70			
26	110	70	66	110	70			
27	100	70	67	130	70			
28	120	80	68	120	80			
29	100	60	69	110	60			
30	130	70	70	140	90			
31	110	80	71	130	80			
32	120	70	72	110	70			
33	140	80	73	120	60			
34	110	70	74	120	80			
35	130	70	75	110	80			
36	120	80	76	130	80			
37	110	60	77	110	70			
38	140	90	78	140	80			
39	130	70	79	150	100			
40	120	80	80	120	70			

# *Abstract*

**NUTRITIONAL STATUS AND STRESS DETERMINANTS OF  
WOMEN WORKERS IN RUBBER PLANTATIONS**

**DHANYA K. PRAKASH**

**Abstract of the  
thesis submitted in partial fulfilment of the requirement  
for the degree of**

**Master of Science in Home Science  
(Food Science and Nutrition)**

**Faculty of Agriculture  
Kerala Agricultural University, Thrissur**

**2005**

**Department of Home Science  
COLLEGE OF AGRICULTURE  
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## ABSTRACT

The abstract of the study is presented here. The present study aims to assess the nutritional status of the women workers, to assess the stress determinants of women workers and to study the relationship between the stress and nutritional status of women workers.

Eighty women working in rubber plantations formed the experimental group and 20 women working solely in household activities formed the control group as subjects of study.

The present study was found that majority of the respondents were in the age group of 36 - 45 and were belonging to Hindus. Majority of the respondents had high school education. Most of the respondents were from nuclear family with four members.

Majority (53.75 percent) of the respondents belonged to the age group 36-45. Eighty percent of the experimental group belonged to the Small family while in the control group all the 20 families belonged to Small family. Educational attainment of the respondents (Experimental Group) indicated that majority of the group (50 percent) had high school level education only 3 percent were illiterate. In the control group majority of this group *i.e.* 50 percent have got high school level education and none of them were illiterate.

The family income of the experimental group reveals that majority (58 percent) of the respondents had the monthly family income between 2500-5000 .In control group 75 percent of the respondents have the income between 2500-5000.On observing monthly expenditure patterns of the families, the respondents spent majority of their income for the

purchase of food items. The food use frequency revealed that the food items like cereals, nuts and oilseeds (coconut), spices and condiments, fats and oils were consumed daily by all the respondents.

Comparing the RDA with the nutrient intake, the intake of energy, protein and calcium was higher than the recommended in experimental group whereas the iron intake was found to be low. The intake of energy, protein, calcium, retinol, riboflavin, and niacin was higher than that of the recommended allowances of the control group. The iron intake was lower than the RDA percent. The fat intake was higher than the RDA.

The result revealed that 10 percent of the respondents were in positive energy balance while 90 percent of them were in negative energy balance. But majority of respondents in control group (55 per cent) was in positive energy balance, as intake was greater than energy expenditure while 45 percent were in negative energy balance.

Sixty four percent of the women were found to be normal, one percent of them were chronically energy deficient and 14 percent of the women had overweight in experimental group. In control group 55 percent of the women were found to be normal, 30 percent women were overweight and 5 percent of them were chronically energy deficient.

Biochemical assessment of the respondents revealed that 66 percent of the experimental group was below the normal level of hemoglobin while in control group it was 45 percent. Thirty three percent of the experimental group had normal range of hemoglobin level and in control group it was 55 percent.

The Nutritional Status Index of the respondents ranged from 250-350. Seventy six percent of the respondents had the mean NSI 321. Twenty percent of the respondents were having an average nutritional status index of 290. Four percent of the respondents had the NSI above 350. In the control group, 75 percent of the respondents had the mean NSI of 324.35. Twenty percent of the respondents were having mean nutritional status index of 289.72 and 5 percent of the respondents were having the NSI of 363.49.

In stress determinants it is found that 77.5 per cent of the experimental were having mild stress and 16.25 per cent had low stress whereas 6.25 percent had high stress. In control group all the respondents had low stress. The experimental group had higher stress when compared to the control group. It is also revealed that stress from environment is related to the nutritional status of experimental group when compared to the control group.

There is relationship between stress scores and health problems. The experimental group had more stress and health problems when compared to the control group. Higher the stress scores more the health problems. It is also found that there is significant relationship between the job stress and health problems of the respondents. The experimental group had more job stress and they were more prone to health problems when compared to the control group.