PREVALENCE OF HYPERTENSION AND ASSESSMENT OF RISK FACTORS AMONG AGRICULTURAL LABOURERS

By

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THESIS

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requirement for the degree of

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DECLARATION

I, hereby declare that this thesis entitled **"Prevalence of hypertension and assessment of risk factors among agricultural labourers"** is a bonafide record of research work done by me during the course of research and that it has not been previously formed the basis for the award to me of any degree, diploma, fellowship or other similar title, of any other University or Society.

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CERTIFICATE

Certified that this thesis entitled **"Prevalence of hypertension and assessment of risk factors among agricultural labourers"** is a bonafide record of research work done independently by **Ms. Archana** under my guidance and supervision and that it has not formed the basis for the award of any degree, diploma, fellowship or associateship to her.

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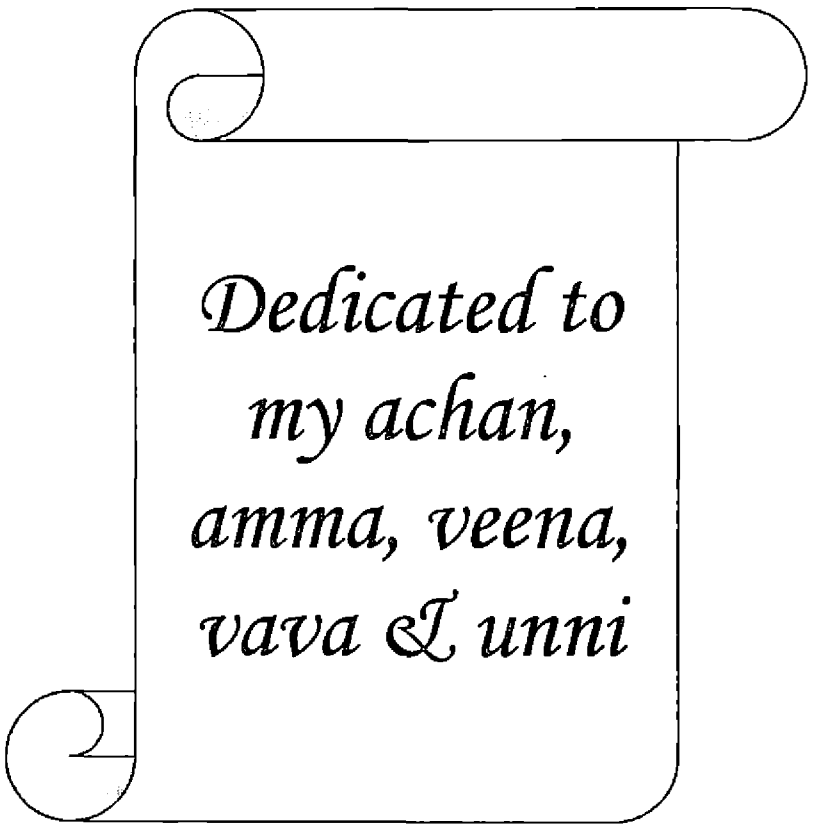
Dedicated to
my achan,
amma, veena,
vava & unni

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ABBREVIATIONS

BMI	Body Mass Index
BP	Blood Pressure
CED	Chronic Energy Deficiency
Con	Control
CVD	Cardio Vascular Diseases
DASH	Dietary Approaches to Stop Hypertension
DBP	Diastolic Blood Pressure
Exp	Experimental
ICMR	Indian Council of Medical Research
ISH	International Society of Hypertension
JNC	Joint National Committee
LPG	Liquid Petroleum Gas
NIN	National Institute of Nutrition
NNMB	National Nutrition Monitoring Bureau
NS	Not Significant
RDA	Recommended Dietary Allowances
RDI	Recommended Dietary Intake
SBP	Systolic Blood Pressure
WHO	World Health Organization
WHR	Waist Hip Ratio

Introduction

1. INTRODUCTION

High blood pressure, termed "hypertension" is a condition that affects almost one billion people world wide and is a leading cause of morbidity and mortality (Bose *et al.*, 2007). Hypertension has been called "silent killer" mainly for two reasons- it is silent since it has no specific symptoms and it is a true killer. People who have hypertension that is not treated are much more likely to die from or be disabled by cardiovascular complications such as stroke, heart attacks, heart failure and kidney failure than people who have normal blood pressure (Richard and Klabunde, 2007).

Hypertension is still largely ignored as a public health problem in most developing countries. However, the adoption of western life styles by people in developing countries has led to a sharp rise in morbidity and mortality from cardiovascular diseases, particularly those related to hypertension (Pobee *et al.*, 2000; Bunker *et al.*, 2004). It is thought that the stresses of every day life with a change in the dietary habits and lack of exercise has led to the increasing incidence of hypertension.

The incidence of hypertension has recently increased throughout the world. Previously it was predominant mostly in industrialized and developed countries. However, of late there has been a sudden increase in the number of cases in developing countries. WHO - ISH (2005) reported that death and disability from cardiovascular diseases are increasing so rapidly in developing countries and will be ranked as the number one cause of the global burden of the disease by the year 2020.

The prevalence pattern of hypertension in developing countries is different from that in the developed countries. In India - a very large, populous and typical developing country - community surveys have documented that the prevalence of hypertension has increased by about 30 times among the urban population over a period of 55 years and about 10 times among rural population over a period of 36 years (Gupta, 1997). In

India, hypertension has been considered as a major public health problem among middle and high socio economic classes (Pai and Halani, 2006).

Among the different factors contributing to the increasing trend of hypertension urbanization, changes in life style, physical inactivity, diet and stress have been considered as the important causes in young.persons including students and labourers (Das *et al.,* 2005). With modernization and changing demographic profile of the population cardiovascular diseases are assuming an increasing importance in India (Reddy, 2004).

The single largest independent risk factor for developing cardio vascular diseases has been found to be elevated blood pressure. The prevalence rate of hypertension varies from population to population due to known and unknown factors. Hence, the present study entitled "Prevalence of hypertension and assessment of risk factors among agricultural labourers" was taken up with the following objectives.

1) To assess the prevalence of hypertension among agricultural labourers
2) To find out the risk factors for hypertension

Review of literature

2. REVIEW OF LITERATURE

A comprehensive review of past studies is highly essential for proper understanding of the concepts, research design and method of analysis in any research programme. Hence, a review of past studies related to the objectives of the study is presented in this chapter. For convenience and clarity, this chapter is divided into four sections as given below:

2.1. Prevalence of hypertension
2.2. Risk factors for hypertension
2.3. Diet in hypertension
2.4. Strategies for primary prevention of hypertension

2.1. PREVALENCE OF HYPERTENSION

India is a vast country with heterogeneous and young population. Till recent past, control and prevention of communicable diseases was given importance. Recently, attention has shifted to control and prevent non-communicable diseases also including hypertension, stroke and coronary artery diseases at the national level in view of the rising trends (WHO, 2003).

Kearney *et al.* (2005a) estimated 972 million adults with hypertension in 2000, out of which 333 million was found to be in economically developed countries and 639 million in economically developing countries. The number of adults with hypertension in 2025 was predicted to increase by about 60 per cent to a total number of 1.56 billion.

Henauw *et al.* (1998) defined hypertension as the mean systolic blood pressure (SBP) ≥140 mm Hg and mean diastolic blood pressure (DBP) ≥90 mm Hg. According

to WHO (2001) hypertension is a condition in which systolic pressure exceeds 160 mm Hg and diastolic pressure exceeds 95 mm Hg.

The Seventh Report of the Joint National Committee (JNC) on Prevention, Detection, Evaluation and Treatment of high blood pressure recommended a classification of hypertension for adults as given below (Chobanian *et al.*, 2003).

Normal	: <120 - 80 mm Hg
Pre- hypertension	: 120 to 139 - 80 to 90 mm Hg
Hypertension- stage 1	: 140 to 159 - 90 to 99 mm Hg
Hypertension- stage 2	: ≥160 - ≥100 mm Hg

However, WHO and ISH (2005) had classified hypertension as

Optimal	: <120 - <80 mm Hg
Normal	: <130 - <85 mm Hg
High normal	: 130 to 139 - 85 to 89 mm Hg
Grade 1 (mild hypertension)	: 140 to 159 - 90 to99 mm Hg
Grade 2 (moderate hypertension)	: 160 to 179 - 100 to 109 mm Hg
Grade 3 (severe hypertension)	: ≥180 - ≥110 mm Hg

Cherry and Woodwill (2002) opined hypertension as the most common disorder encountered in outdoor patients. According to Srilakshmi (2005) high blood pressure is not a disease but only a symptom indicating that some underlying disease is progressing. However, Erhun *et al.* (2005) indicated hypertension as a common health problem in developed countries and a major risk factor for cardiovascular diseases (CVD). Kearney *et al.* (2005b) indicated hypertension as an important public health challenge, increasing world wide.

An epidemiological shift in the prevalence of hypertension in developing countries as compared to developed countries had been observed by Reddy (1996) and Nissien *et al.* (1998). Studies from India and Bangladesh had shown upward trend in the prevalence of hypertension (Hypertension study group, 2001). WHO (2002) reported 7.1 million deaths due to high blood pressure.

In a meta analysis of 34 epidemiological studies from rural and urban populations of India, Gupta (1997) concluded hypertension as a major health problem in India and was found to be more in urban than in rural subjects.

Dubey (1954) carried out one of the earliest studies in India and documented 4 per cent prevalence of hypertension among industrial workers of Kanpur. Wasir *et al.* (1984) reported 3 per cent prevalence of hypertension in Delhi. During 1984 - 1987 the prevalence of hypertension was found to be 11 per cent among male and 12 per cent among female population in the urban areas of Delhi and 4 per cent and 3 per cent respectively in rural areas (Chadha *et al.,* 1990). Nissien *et al.* (1998) reported an increasing trend in the prevalence of hypertension among urban (2.24 per cent in 1949 to 36.4 per cent in 2003) and rural population (1.99 per cent in 1958 to 21.2 per cent in 1994).

Kutty (1993) reported prevalence of hypertension during the year 1991 as 18 per cent in Thiruvanathapuram district of Kerala. ICMR (1994) conducted a study among 5537 individuals, both in rural and urban areas and the prevalence rate was found to be 25 per cent and 29 per cent respectively among male and female population in urban Delhi and 13 per cent and 10 per cent respectively in rural Haryana. A study carried out by Malhotra *et al.* (1999) indicated 4.5 per cent prevalence of hypertension among un-industrialized rural population of North India with a significantly higher prevalence among females.

An analysis of mean systolic and diastolic pressures among urban Indian population in the age group of 40-59 years showed an increase of mean systolic blood pressure from 120.4 mm Hg (SBP) and 73.2 mm Hg (DBP) in 1942 to 128.7 mm Hg and 84.2 mm Hg in 1985, 128.8 mm Hg and 83.2 mm Hg in 1995 and 141 mm Hg and 85 mm Hg in 1997 (Gupta, 1997). Urban studies from India showed an increase in overall prevalence of hypertension from 6.64 per cent in 1988 to 36.4 per cent in 2003 (Hussain *et al.*, 1988; Gupta and Sharma, 1994; Gupta *et al.*, 1995; Kalavathy *et al.*, 2000; Anand, 2001; Shanthirani *et al.*, 2003; Bharucha and Kuruvilla, 2003).

A study conducted by Singh *et al.* (1998) among women in the age group of 20 to 64 years in five cities of India, prevalence of hypertension was reported to be highest in Thiruvanathapuram. In another study conducted by Hypertension Study Group (2001) among the elderly populations in Kerala and Maharashtra states of India and Dhaka in Bangladesh reported a very high prevalence of hypertension both in urban (69%) and rural (55%) Kerala. Mohan *et al.* (2001) reported 8.4 per cent prevalence of hypertension among men and women belonging to the low socio economic group.

Three serial epidemiological studies carried out in Jaipur during 1994, 2001 and 2003 by Gupta *et al.* (1995 and 2002) and Gupta (2004) demonstrated rising prevalence of hypertension among males and females. Kutty *et al.* (2002) also reported 55 per cent prevalence of hypertension in Kerala. Hazarika *et al.* (2002) reported 61 per cent prevalence among men and women aged 30 and above in Assam. Another study conducted by Zachariah *et al.* (2003) among middle aged population in Thiruvanathapuram city also confirmed a very high prevalence of hypertension (54.5%). Gupta (2004) indicated regional variation in the prevalence of hypertension.

2.2. RISK FACTORS FOR HYPERTENSION

Due to quickening pace of adoption of changing life styles by people in developing countries, a sharp rise in morbidity and mortality from cardiovascular

diseases, particularly those related to hypertension was observed by Mbanya *et al.* (1998).

A strong correlation between changing life style and increase in prevalence of hypertension in India was reported by Gupta *et al.* (1994), Gupta and Sharma (1994), Gupta *et al.* (1995) and Reddy and Yusuf (1998). Mohan (1996) indicated progressive urbanization, life style modification and sedentary habits as some of the important factors responsible for the higher prevalence of hypertension. Singh *et al.* (1997) observed significant association between hypertension with higher social classes.

Gupta (1997) indicated significant correlation between hypertension with age, sedentary activity, smoking and body mass index (BMI). Singh *et al.* (1997) observed middle and higher socio economic status, higher BMI and obesity as strong predictors for hypertension. Diabetes mellitus, smoking, illiteracy as well as low and high socio economic status also were described as risk factors for hypertension (Kaplan and Keil, 1993; Gupta and Gupta, 1994; Gupta *et al.*, 1995; Singh, 1995).

Heyka (1999) indicated obesity as one of the most important risk factors for hypertension. According to Garrison *et al.* (2001) obesity alone possibly accounted for 78 per cent and 65 per cent of essential hypertension in men and women respectively. In the Framingham off-spring study conducted among young and middle aged adults, 64 to 78 per cent of newly developed hypertension was found to be associated with obesity (Vasan *et al.*, 2001).

WHO (1983) reported cigarette smoking as one of the significant risk factors for hypertension. Paul (1999) also reported increased morbidity and mortality in hypertensive smokers.

Cross sectional surveys and clinical assessments in developing and developed countries showed a consistent relationship between age and hypertension (Nissinen *et al.*, 1988; Whelton, 1994; Stamler, 1994).

Alcohol consumption was found to be another important risk factor for developing hypertension (McMohan, 1987). Consumption of more than 210g of alcohol per week was found to be associated with an increased risk of hypertension (Keil *et al.*, 1993 and Fucks *et al.*, 2001).

Salt intake was also found to be an important risk factor for developing hypertension (Dole *et al.*, 1950).

Kalpan (1997) reported a link between job stresses and elevation in blood pressure. Fauvel *et al.* (2001) also indicated a strong relationship between psychological stress and high blood pressure and unfavorable cardiovascular profile.

2.3. DIET IN HYPERTENSION

Diet plays an important role in the causation of cardiovascular diseases (Abraham and Jagannathan, 1999). Hypertension cannot be cured, but it can be controlled through life style changes and medication. Various studies have shown that modest life style and dietary changes can help to treat and often delay or prevent high blood pressure (Anderson *et al.*, 2005).

Dietary guidelines for the prevention and treatment of hypertension emphasized a healthy eating pattern called the Dietary Approaches to Stop Hypertension (DASH) in addition to avoidance of obesity, high salt intake and excessive alcohol intake (Miura, 2005).

The effect of DASH diet rich in fruits, vegetables and complex carbohydrates in adults with high blood pressure was studied by Anderson *et al.* (1997) and indicated a decrease in blood pressure within eight weeks who followed the DASH diet.

Dewan and Rowlands (1986) opined that subjects consuming fats like ghee, butter and vanaspti had higher blood pressure levels than those consuming oils. Supplementation of fish oil also showed a reduction in blood pressure (Appel *et al.*, 1993). The beneficial effects of fish and mustard oils rich in unsaturated fatty acids on reduction of blood pressure, lowering of lipids and their antithrombotic effects were reported by Lungershausen *et al.* (1994). An increased prevalence of hypertension with increased consumption of edible oil and ghee was reported by Haldiya *et al.* (2004). Higher intake of fruits and vegetables and a lower intake of red meat were found to be effective in preventing high blood pressure (Nakagawa, 2005).

Kempner had put forward the hypothesis of increased blood pressure with high salt intake and suggested rice and fruit diet for hypertensive subjects (Dole *et al.*, 1950). Konjuri and Rahimi (2007) also reported 'no added salt diet' as the best known diet for hypertension.

Potassium supplementation was associated with a decrease in SBP and DBP by 3 and 2 mm Hg respectively (Whelton *et al.*, 1997). Stamler *et al.* (1997) observed an increase in blood pressure by 5-15 mm Hg by acute consumption of 2-3 cups of coffee.

Epidemiological studies suggested an association between low levels of antioxidants and increased risk of CVD (Wingard and Barett, 1995). A study conducted by Varma *et al.* (2007) observed that appropriate antioxidant therapy could be useful for hypertensive alcoholics and to prevent various cardiovascular complications.

The usefulness of dietary fiber in the management of hypertension and obesity through its effect on energy density of food and the extend of interference with nutrient bioavailability was indicated by George (1992), Anderson (1993) and Wright *et al.* (1999).

Reed *et al.* (1985) suggested a diet low in sodium and fat and high in potassium to lower hypertension. In severe hypertension a restriction of 20 g of protein per day was suggested by Frost *et al.* (1991). For obese patients a restriction in calories was suggested by Kotchen (1997) and Kok *et al.* (2002).

2.4. STRATEGIES FOR PRIMARY PREVENTION OF HYPERTENSION

Paul (1999) suggested modifications in diet and lifestyle as the important strategies for the management and prevention of hypertension.

Various population based strategies like decrease sodium content in diet, decrease calorie density in processed food, and provision of safe and convenient opportunities for exercise were suggested by Chobanian *et al.* (2003) for primary prevention of hypertension. Krousel *et al.* (2004) indicated population based strategy and an intensive targeted strategy for high risk groups for primary prevention of hypertension.

The blood pressure lowering effect of weight reduction could be enhanced by a simultaneous increase in physical exercise and moderation in alcohol consumption among over weight drinkers and by reduction in sodium intake (Puddey *et al.*, 1992). Tunstall *et al.* (1997) reported weight reduction as an effective approach to decrease SBP and DBP by 2.9 and 2.3 mm Hg respectively after an average weight loss of 3.9 kg. Kaplan (1998) also reported the same result in a study on hypertension and weight reduction.

Based on the overwhelming evidence from clinical studies and meta analysis, weight reduction was recommended as an important intervention for primary prevention of hypertension (Ebrahim and Smith, 1998). Epidemiological studies also revealed a strong relation between obesity and hypertension (Bray, 2003).

Whelton *et al.* (2002) observed a reduction in SBP and DBP by 4.04 mm Hg and 2.33 mm Hg in normotensive persons who took aerobic exercise. Regular aerobic physical activity like brisk walking, swimming or cycling for 30 minutes daily for most days of a week was recommended for primary prevention of hypertension by Krousel *et al.* (2004).

Clinical studies showed a decrease in blood pressure by 4 to 5 mm Hg in persons who did not consume alcohol (Xin *et al.*, 2001).

Paul (1999) and Darwin and Carma (2002) indicated decrease in blood pressure in non smokers.

Stress reduction with yoga, meditation, and bio-feed back relaxation exercises also had positive effect in lowering blood pressure (Patel, 1995; Alexander *et al.*, 1996). Clinical studies showed the effectiveness of bio-feed back intervention in mild hypertension (Henderson *et al.*, 1998; Luskin *et al.*, 1998; Nakao *et al.*, 2000).

The DASH trail showed a reduction in blood pressure in normotensive patients who followed fruit or vegetarian diet in combination with reduced fat and cholesterol intake (Sacks *et al.*, 2001).

In a meta analysis of 12 randomized controlled clinical studies in normotensive individuals, an average daily reduction of 77micromol of dietary sodium intake resulted in 1.9 mm Hg decrease in SBP (Cutler *et al.*, 1997; Sacks *et al.*, 2001).

Whelton *et al.* (1997) and Whelton and He (1999) observed the effectiveness of potassium supplementation in lowering blood pressure in normotensive and hypertensive individuals. He and Whelton (1997) suggested potassium rich foods like fruits, fruit juices and vegetables for primary prevention of hypertension.

Based on the results of DASH and other studies, macronutrient alteration in diet was recommended by Vasan *et al.* (2002) for primary prevention of hypertension.

Morris *et al.* (1993), Bucher *et al.* (1996) and Jee *et al.* (1999) indicated the beneficial effect of increase calcium and fish oil intake and reduced caffeine intake in lowering blood pressure.

Materials and Methods

3. MATERIALS AND METHODS

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

3.1.Selection of samples

3.2. Plan of the study

3.3. Methods adopted for the study

3.4. Development of tools and conduct of the study

3.5. Analysis of the data

3.1. Selection of samples

The study was conducted purposively among the agricultural labourers of Kerala Agricultural University. The labourers working at College of Horticulture, Instructional Farm, Central Nursery and Coconut Development Farm of the main campus of Kerala Agricultural University, Vellanikkara and at ARS Mannuthy were selected for the study. From the total labourers of the above farms of Kerala Agricultural University, 200 labourers in the age group of 35 to 60 years were selected randomly and their blood pressure was recorded initially. These 200 samples were further classified according to sex and also on the basis of their blood pressure as non hypertensive and hypertensive groups. From this list, 50 male and 50 female labourers who are hypertensive (BP >120–80 mm Hg) and 25 male and 25 female labourers who are non hypertensive (BP <120–80 mm Hg) were selected for the study as experimental and control groups respectively.

To conduct the detailed study, a sub sample of 10 respondents from experimental group (hypertensive) and 5 from control group (non hypertensive) from each sex was also selected randomly.

3.2. Plan of the study

The plan of the study was as follows:

3.2.1. Determination of blood pressure to select control and experimental groups.

3.2.2. A base line survey to collect data on socio economic status of the families and personal habits and working pattern of the respondents.

3.2.3. A dietary survey to assess the food consumption pattern of the respondents.

3.2.4. Assessment of nutritional status of the respondents through

3.2.4.1. Anthropometric measurements

3.2.4.2. Food weighment survey (sub sample).

3.3. Methods adopted for the study

Determination of suitable methods and procedures is very important to get accurate and reliable data. Interview method was used to collect the required information on the socio economic status of the families and personal habits, working pattern and food consumption pattern of the respondents.

Bass *et al.* (1979) indicated interview method as the most suitable way to collect data since it proceeds systematically and enables quick recording. According to Gupta (1987) the information received from an interview schedule is more reliable as the accuracy of the statements can be checked by supplementary questions.

Thimmayamma and Rau (1996) indicated that diet is a vital determinant of health and nutritional status. Diet surveys are mainly of two types one which concentrates on qualitative aspects of the foods and the other which estimates the amount of food consumed in quantitative terms.

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

1. Recording anthropometric measurements
2. Monitoring actual food and nutrient intake

Anthropometry has been accepted as an important method for assessment of nutritional status and it is a simple and useful practical index (Jelliffee, 1966; Mc Laren *et al.,* 1984; Vijayaraghavan, 1987). Anthropometric indices, presence of clinical deficiency signs, dietary assessment and actual food intake were widely used as direct parameters of nutritional status (Aebi, 1983).

According to Rao and Vijayaraghavan (1996), anthropometry can help in the assessment of sub clinical stages of malnutrition and it has been recognized as a reliable tool to identify nutritionally vulnerable groups.

Body weight is the most widely used and the simplest anthropometric measurement for the evaluation of nutritional status (Swaminathan, 1987; Rao and Vijayaraghavan, 1996). A change in body weight may be the result of change in the health of an individual, change in dietary supplies or even change in one's physical activity. Body weight is a sensitive indicator of nutritional status (Venkitalakshmi and Peramma, 2000).

Height deficit is an indicator of long term malnutrition. The extent of height deficit in relation to age as compared to regional standards can be regarded as a measure of malnutrition (Gopaldas and Seshadri, 1987). According to Rao and Vijayaraghavan (1996), among the environmental factors, which influence the height of an individual, nutrition and morbidity are very important because, inadequate dietary intake or

infections reduce nutrient availability at cellular level leading to growth retardation and stunting.

In the present study, anthropometric measurements like weight and height of the respondents were recorded using standard methods suggested by Jelliffee (1966).

Body Mass Index (BMI) is used as an indicator of nutritional status of adults (Brahmam, 1999). In order to assess the nutritional status of the respondents BMI was calculated by the formula:

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

According to Lean *et al.* (1995) waist circumference is used as a measure for indicating the need for weight management. The authors also indicated that the waist hip ratio (WHR) reflects the proportion of body fat located intra abdominally as opposed to that in the subcutaneous region.

To measure the waist and hip circumference of the respondents the technique suggested by Chadha *et al.* (1995) was followed and the circumference of the waist at the umbilicus and hip circumference at the maximum point of protrusion was measured and waist hip ratio was computed.

Food consumption surveys provide data on the type and amount of food consumed by a representative sample of the survey population (Schofield, 1985). Diet surveys constitute an essential part of any complete study of nutritional status of individuals or groups and provide essential information on nutrient intake levels, source of nutrients, food habits and attitudes (Gopaldas and Seshadri, 1987). Devadas and

Easwaran (1997) observed food weighment as the most reliable method to assess the actual food intake of an individual.

Since, the diets consumed by rural low income categories are more or less uniform with negligible variations in their day to day intake, Jansi and Sarojini (1991) indicated that the food intake pattern and quantities of food consumed can be obtained by following a one- day food weighment method. According to Mari (1995) actual food consumption within the family by one day weighment could be better mentioned in micro samples.

Hence, in the present study one- day food weighment survey was conducted in a sub sample to assess their actual food and nutrient intake.

3.4. Development of tools and conduct of the study

Tools are certain instruments, which are used in research for gathering new facts.

To measure the blood pressure of agricultural labourers, the standardized protocol suggested by Beevers *et al.* (2001) was followed. The subjects were asked to take rest for at least 10 minutes and two blood pressure measurements were taken with the help of a trained laboratory technician at an interval of 5 minutes in optimal room conditions with an electronic sphygmomanometer. The measurements were taken during their interval time from the work spot. The mean of the two readings was accepted as BP. The respondents were classified on the basis of their blood pressure as per the classification suggested by JNC VII criteria as detailed below:

Normal	: <120 - 80 mm Hg
Pre- hypertension	: 120 to 139 - 80 to 90 mm Hg
Hypertension- stage 1	: 140 to 159 - 90 to 99 mm Hg
Hypertension- stage 2	: ≥160 - ≥100 mm Hg

To collect information on the socio- economic status of the families, personal habits, working pattern and food consumption pattern of the respondents, two interview schedules were prepared. The interview schedule for obtaining the socio economic conditions, personal habits and working pattern of the respondents comprised of information pertaining to the type of family, details of family members according to age and sex, education and occupational status of family members, monthly income, size of land holding, crops cultivated, domestication of animals, savings, indebtedness, monthly expenditure pattern, medical history, mode of commutation, housing conditions, quantum of work, nature of work, number of days of labour and personal habits.

The schedule to find out the food consumption pattern of the respondents included food habits, frequency of use of various food groups, meal pattern, use of processed foods, details of salt rich foods, type of oil used, use of pickle, pappad, dried fish and fried food items, food included and avoided to control hypertension.

Both these schedules were pretested by field application and are given in Appendix I and II respectively.

Anthropometric measurements like height and weight of the respondents were taken as suggested by Jelliffee (1966).

Weight was recorded using a bathroom balance, which was checked by calibration with standard weights. Weight was recorded with minimum clothing on the subject and expressed in kilogram.

Height was measured by using a fiberglass tape. The subject was asked to stand straight without slippers, with the heels, buttocks, shoulder and occiput against the wall. The height was recorded in centimeters.

The technique suggested by Chadha *et al.* (1995) was followed to measure waist and hip circumferences. The circumference of waist at the umbilicus was measured for waist circumference and the circumference of hip at the maximum point of protrusion was measured for hip circumference.

One- day food weighment survey was conducted among the sub sample. The weight of raw ingredients included in the meal for a day and the weight of the cooked foods were recorded. All these weights were taken with standard measuring cups and spoons and also by means of a food weighing balance. The amount of cooked foods consumed by the respondents was measured and converted to its raw equivalents. The nutritive value of the food consumed was computed using food composition tables (Gopalan *et al.*, 1989).

3.5. Analysis of the data

To interpret the results, the data were analyzed using percentage analysis, Odds ratio, t- test and Spearman's correlation analysis.

Results

4. RESULTS

The results of the study on "Prevalence of hypertension and assessment of risk factors among agricultural labourers" are presented in this chapter under the following sub headings.

1. Socio economic status of the families
2. Personal habits and working pattern of the respondents
3. Food consumption pattern of the respondents
4. Nutritional status of the respondents
5. Prevalence and risk factors for hypertension

4.1. SOCIO ECONOMIC STATUS OF THE FAMILIES

The socio economic profile of the families was studied with special reference to their age, religion, caste, type of family, marital status, composition of the family, educational status of family members and respondents, occupational status of family members, monthly family income, other sources of income, total land holdings, cultivation of crops, domestication of animals, kitchen garden, details of loan, monthly expenditure pattern, housing conditions, use of fuel, use of health care facilities and mode of commutation.

4.1.1. Age of the respondents

From Table 1, it is clear that 20 per cent of male and female respondents in control group belonged to the age group of 35 to 40 years and in experimental group it was 28 per cent and 4 per cent respectively. About 32 per cent of male and 20 per cent of female respondents in control group belonged to 41 to 45 years and in experimental group it was 18 per cent and 22 per cent respectively. Nearly, 24 per cent (male) and 32

per cent (female) in control group and 32 per cent (male) and 38 per cent (female) in experimental group were in the age group of 51 to 55 years.

Table 1. Distribution of respondents on the basis of age

Age (Years)	Number of respondents			
	Control		Experimental	
	Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
35-40	5 (20)	5 (20)	14 (28)	2 (4)
41-45	8 (32)	5 (20)	9 (18)	11 (22)
46-50	5 (20)	4 (16)	8 (16)	8 (16)
51-55	6 (24)	8 (32)	16 (32)	19 (38)
56-60	1 (4)	3 (12)	3 (6)	10 (20)

(Figures in parenthesis are percentages)

4.1.2. Religion, caste, type of family and family size

Details of religion, caste, type of family and family size are presented in Table 2.

The table reveals that most of the families in control group (80% and 68%) were Hindus and in experimental group it was 76 per cent. Only 8 to 12 per cent of the families in both groups belonged to Muslim community and the rest of the families were found to be Christians.

Among Hindus, majority of the families belonged to forward caste in both groups. This was found to be 65 per cent and 60.55 per cent males and 58.82 per cent and 60.53 per cent females respectively in control and experimental groups. About 20 to

29 per cent belonged to other backward communities. Families belonging to scheduled caste comprised of 10.53 to 17.65 per cent.

Majority of families in control group (96 per cent (male) and 92 per cent (female)) and experimental group (92 per cent (male) and 92 per cent (female)) followed nuclear family system and the rest followed joint family system.

The family size of the respondents indicated that as much as 48 per cent (male) and 52 per cent (female) in control group had 4 to 6 members and in experimental group this was 76 per cent and 60 per cent respectively. About 40 per cent and 44 per cent of the families in control group had up to 3 members and in experimental group it was 16 per cent and 30 per cent respectively. Rest of the families had 7-9 members.

4.1.3. Marital status of the respondents

The details of marital status of the respondents are presented in Table 3.

From the Table, it is clear that about 92 per cent male and 88 per cent female respondents in control group were married and in experimental group 92 per cent males and 90 per cent females were married. About 8 per cent and 4 per cent of male and female respondents in control group was divorced and in experimental group this was found to be 8 per cent and 6 per cent respectively. Among the female respondents in control and experimental groups 8 per cent and 4 per cent respectively were widowed.

4.1.4. Composition of the family

Details regarding composition of the families are presented in Table 4.

Table 2. Details regarding religion, caste, type of family and family size

Sl. No.	Category	Number of families			
		Control		Experimental	
		Male	Female	Male	Female
1	Religion				
	Hindu	20 (80)	17 (68)	38 (76)	38 (76)
	Muslim	2 (8)	3 (12)	6 (12)	6 (12)
	Christian	3 (12)	5 (20)	6 (12)	6 (12)
	Total	25 (100)	25 (100)	50 (100)	50 (100)
2	Caste				
	Forward caste	13 (65)	10 (58.82)	23 (60.53)	23 (60.53)
	Other backward caste	4 (20)	4 (23.53)	11 (28.94)	11 (28.94)
	Scheduled caste	3 (15)	3 (17.65)	4 (10.53)	4 (10.53)
	Total	20 (100)	17 (100)	38 (100)	38 (100)
3	Type of family				
	Joint	1 (4)	2 (8)	4 (8)	4 (8)
	Nuclear	24 (96)	23 (92)	46 (92)	46 (92)
	Total	25 (100)	25 (100)	50 (100)	50 (100)
4	Family size (Number)				
	1-3	10 (40)	11 (44)	8 (16)	15 (30)
	4-6	12 (48)	13 (52)	38 (76)	30 (60)
	7-9	3 (12)	1 (4)	4 (8)	5 (10)
	Total	25 (100)	25 (100)	50 (100)	50 (100)

(Figures in parenthesis are percentages)

It was found that 46.88 per cent and 43.65 per cent of male members in control and experimental groups respectively belonged to the age group of 21 to 50 years and the female members in this age group was found to be 41.77 per cent (control) and 46.71 per cent (experimental).The male members in 51 to 60 years of age in control and experimental groups were found to be 9.37 per cent and 15.08 per cent and female members of the same age group were found to be 5.06 per cent and 3.29 per cent.

Children below 10 years (boys) constituted 10.94 per cent in control and 11.11 per cent in experimental groups. The percentage of female children was found to be 11.39 per cent (control) and 11.18 per cent (experimental).

Table 3.Marital status of respondents

Sl. No.	Marital status	Number of respondents			
		Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
1	Married	23 (92)	22 (88)	46 (92)	45 (90)
2	Divorced	2 (8)	1 (4)	4 (8)	3 (6)
3	Widowed	-	2 (8)	-	2 (4)

(Figures in parenthesis are percentages)

Table 4. Distribution of family members on the basis of age and sex

Sl. No.	Age (Years)	Number of members			
		Male		Female	
		Control	Experimental	Control	Experimental
1	0-10	7 (10.94)	14 (11.11)	9 (11.39)	17 (11.18)
2	11-20	17 (26.56)	31 (24.60)	26 (32.91)	56 (36.84)
3	21-30	8 (12.5)	32 (25.39)	13 (16.45)	24 (15.78)
4	31-40	7 (10.94)	11 (8.73)	5 (6.34)	16 (10.54)
5	41-50	15 (23.44)	12 (9.53)	15 (18.98)	31 (20.39)
6	51-60	6 (9.37)	19 (15.08)	4 (5.06)	5 (3.29)
7	>60	4 (6.25)	7 (5.56)	7 (8.87)	3 (1.98)
	Total	64 (100)	126 (100)	79 (100)	152 (100)

(Figures in parenthesis are percentages)

4.1.5. Educational status of family members

The educational status of family members in the age group of 18 to above 55 years is presented in Table 5.

It was found that about 54.28 per cent and 45.57 per cent of male members and 28.6 per cent and 43.01 per cent of female members in the age group of 18 to 45 years attained high school level of education. Among 45 to 55 years of age 60 per cent and 25 per cent of male members in control and experimental groups also attained high school level of education. Among female members this was found to be 30 per cent in control and 17.64 per cent in experimental groups. About 29 per cent (control) and 47 per cent (experimental) of male members in the age group of 18 to 45 years also attained college level of education. The female members who attained college level of education were found to be 61.90 per cent (control) and 43.01 per cent (experimental). Nearly 12.5 to 31.25 per cent of male and 31.25 to 50 per cent of female members above 55 years in control and experimental groups were found to be illiterate.

4.1.6. Educational status of respondents

Details regarding educational status of the respondents are presented in Table 6.

In control group, about 36 per cent and 20 per cent of male and female respondents were illiterate while in experimental group illiteracy was found among 52 per cent male and 40 per cent female respondents. About 16 per cent and 34 per cent male respondents in control and experimental groups had attained lower primary level of education and among female respondents this was 24 per cent and 26 per cent respectively. The male respondents who attained upper primary level of education were found to be 28 per cent in control group and 4 per cent in experimental group and among females it was 32 per cent and 20 per cent respectively. About 20 per cent and

Table 5. Educational status of family members (18 to above 55 years)

Educational status	18-45 years				45-55 years				>55 years			
	Male		Female		Male		Female		Male		Female	
	Con	Exp	Con	Exp	Con	Exp	Con	Exp	Con	Exp	Con	Exp
Primary school	6 (17.15)	6 (7.59)	4 (9.52)	13 (13.98)	-	9 (45)	3 (30)	13 (76.48)	4 (50)	9 (56.25)	3 (21.43)	6 (37.45)
High school	19 (54.28)	36 (45.57)	12 (28.6)	40 (43.01)	3 (60)	5 (25)	3 (30)	3 (17.64)	3 (37.5)	2 (12.5)	3 (21.43)	-
College	10 (28.57)	37 (46.84)	26 (61.90)	40 (43.01)	1 (20)	3 (15)	2 (20)	-	-	-	1 (7.14)	5 (31.25)
Illiterate	-	-	-	-	1 (20)	3 (15)	2 (20)	1 (5.88)	1 (12.5)	5 (31.25)	7 (50)	5 (31.25)
Total	35 (100)	79 (100)	42 (100)	93 (100)	5 (100)	20 (100)	10 (100)	17 (100)	8 (100)	16 (100)	14 (100)	16 (100)

(Figures in parenthesis are percentages)
Con- Control, Exp- Experimental

24 per cent of male and female respondents in control group and 10 per cent and 14 per cent respondents in experimental group attained high school level of education. None of the respondents had attained college level of education.

Table 6. Educational status of respondents

Sl. No.	Educational status	Number of respondents			
		Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
1	Illiterate	9 (36)	5 (20)	26 (52)	20 (40)
2	Lower primary	4 (16)	6 (24)	17 (34)	13 (26)
3	Upper primary	7 (28)	8 (32)	2 (4)	10 (20)
4	High school	5 (20)	6 (24)	5 (10)	7 (14)

(Figures in parenthesis are percentages)

4.1.7. Occupational status of family members

Details on occupational status of family members are given in Table 7.

Out of the total members above 18 years, it was found that 29.16 per cent of male members in control group and 18.26 per cent in experimental group were engaged as agricultural labourers. In the case of females this was 9.09 per cent and 2.38 per cent respectively. About 25 per cent and 30.44 per cent male members in control and experimental groups were engaged in private jobs while this was found to be 3.03 per cent and 2.38 per cent among females. Majority of female members in control (87.88 %) and experimental groups (95.24%) had no occupation.

Table 7. Occupational status of family members

Sl. No.	Occupation	Number of members			
		Control		Experimental	
		Male	Female	Male	Female
1	Agricultural labourers	14 (29.16)	6 (9.09)	21 (18.26)	3 (2.38)
2	Private jobs	12 (25)	2 (3.03)	35 (30.44)	3 (2.38)
3	Business	4 (8.34)	-	5 (4.35)	-
4	No occupation	18 (37.5)	58 (87.88)	54 (46.95)	120 (95.24)
	Total	48 (100)	66 (100)	115 (100)	126 (100)

(Figures in parenthesis are percentages)

4.1.8. Monthly family income

About 34 per cent and 28 per cent of families in control and experimental groups respectively had monthly income in the range of Rs. 2000 to 4000 while 38 per cent and 21 per cent of the families had a monthly income in the range of Rs. 4001 to 6000. Only 4 per cent and 18 per cent of the families in control and experimental groups respectively earned Rs. 8001 to 10,000 per month. The details are presented in Table 8.

Table 8. Monthly income of families

Sl. No.	Income (Rs.)	Number of families	
		Control (n=50)	Experimental (n=100)
1	2000-4000	17 (34)	28
2	4001-6000	19 (38)	21
3	6001-8000	12 (24)	33
4	8001-10,000	2 (4)	18

4.1.9. Other sources of income

Details regarding other sources of income are presented in Table 9.

It was observed that 50 per cent and 51 per cent of families in control and experimental groups received income only through their occupation as agricultural labourers. About 38 per cent and 24 per cent of families received income through small business and others received income either through dairy, poultry or through house rent.

Table 9. Other sources of income

Sl. No.	Sources	Number of families	
		Control (n=50)	Experimental (n=100)
1	Poultry	-	11
2	Business	19 (38)	24
3	Dairy	4 (8)	3
4	House rent	2 (4)	11
5	Nil	25 (50)	51

4.1.10. Availability of land

Eighty per cent of the families in control and 38 per cent of the families in experimental groups owned 5 to 10 cents of land while 2 per cent and 21 per cent had 11 to 15 cents of land as their own. About 2 per cent and 9 per cent of families owned 21 to 25 cents. Only 4 per cent and 19 per cent of the families in control and experimental groups respectively owned less than 5 cents of land. The details are given in Table 10.

Table 10. Details regarding possession of land

Sl. No.	Area (cents)	Number of families	
		Control (n=50)	Experimental (n=100)
1	<5	2 (4)	19
2	5-10	40 (80)	38
3	11-15	1 (2)	21
4	16-20	2 (4)	11
5	21-25	1 (2)	9
6	>25	4 (8)	2

4.1.11. Cultivation of crops

From Table 11, it is clear that only 16 per cent and 10 per cent of families in control and experimental groups cultivated coconut. In experimental group 13 per cent of families cultivated paddy and 7 per cent had cashew and pepper in their land. Majority of the families in control (84%) and experimental (70%) groups did not cultivate any crops in their land.

Table 11. Details of cultivation of crops

Sl. No.	Category	Number of families	
		Control (n=50)	Experimental (n=100)
1	Coconut	8 (16)	10
2	Cashew and pepper	-	7
3	Paddy	-	13
4	No crops	42 (84)	70

4.1.12. Domestication of animals

From Table 12, it is clear that only 8 per cent and 14 per cent of families in control and experimental groups respectively possessed domestic animals. Out of this all families in control group and 14.28 per cent of families in experimental group received income from domestic animals.

Table 12. Details of domestication of animals

Sl.No.	Category	Number of families	
		Control (n=50)	Experimental (n=100)
1	Domestic animals present	4 (8)	14
2	No domestic animals	46 (92)	86
3	Receiving income	4 (100)	2 (14.28)
4	Not receiving income	-	12 (85.72)

4.1.13. Kitchen garden

None of the families surveyed had a kitchen garden in their household.

4.1.14. Indebtedness

Regarding indebtedness, it was found that 92 per cent of families in control group and 76 per cent of families in experimental group borrowed money on loan basis either from bank, university or other sources like neighbours, friends, private chitty etc. The details are presented in Table 13. It was found that among the families who took loan, 86 per cent and 70 per cent of families in control and experimental groups respectively took loan to clear their debts. Only a minority took loan for marriage purpose and construction of house. The amount of loan varied from Rs. 5000 to 60,000.

Table 13. Loan taken by the families

Category	Purpose	Amount (Rs.)	Number of families	
			Control (n=50)	Experimental (n=100)
University	Marriage	30,000-40,000	2 (4)	4
Bank	House construction	50,000-60,000	1 (2)	2
Other sources	To clear the debt	5000- 15,000	43 (86)	70
	Nil	-	4 (8)	24

4.1.15. Monthly expenditure pattern

Tables 14 and 15 depict the percentage of income spent on food, clothing, education, health, transport, fuel, electricity, shelter, recreation, luxury, remittance and savings by the control and experimental groups respectively.

It is clear that 82 per cent of the families in control group spent between 20 to 50 per cent of their income for food where as in experimental group, 43 per cent of the families spent between 30 to 50 per cent of their income for food. Sixteen per cent and 40 per cent of the families in control and experimental groups respectively spent more than 55 per cent of their income for food.

Besides 22 per cent families in control and 12 per cent in the experimental group, all others spent less than 5 per cent of their monthly income for the purchase of clothing. All families in control and experimental groups spent less than 5 per cent of monthly income for shelter.

It was also observed that majority of the families in control and experimental groups spent less than 10 per cent of their monthly income for other purposes like transportation, recreation, electricity, health and luxury. About 58 per cent, 6 per cent and 12 per cent of the families in control group did not spent money for education, electricity and fuel respectively. Nearly 63 per cent, 4 per cent and 40 per cent of the families in experimental group also did not spent money for education, electricity and fuel respectively.

Most of the families in control group (92%) and in experimental group (78%) spent up to 50 per cent of their income as remittance as loan.

Table 14. Monthly expenditure pattern of the respondents in control group (n=50)

Percentage of income	Food	Clothing	Shelter	Transport	Recreation	Education	Electricity	Health	Luxury	Remittance	Savings	Fuel
Nil	-	-	-	-	-	29(58)	3(6)	-	-	4(8)	30(60)	6(12)
<5	-	39(78)	50(100)	14(28)	50(100)	13(26)	42(84)	48(96)	44(88)	7(14)	15(30)	18(36)
5-10	-	11(22)	-	28(56)	-	5(10)	4(8)	2(4)	6(12)	4(8)	5(10)	25(50)
10-15	-	-	-	2(4)	-	-	1(2)	-	-	4(8)	-	1(2)
15-20	1(2)	-	-	3(6)	-	-	-	-	-	8(16)	-	-
20-25	6(12)	-	-	1(2)	-	3(6)	-	-	-	5(10)	-	-
25-30	9(18)	-	-	-	-	-	-	-	-	12(24)	-	-
30-35	10(20)	-	-	2(4)	-	-	-	-	-	6(12)	-	-
35-40	10(20)	-	-	-	-	-	-	-	-	-	-	-
40-45	2(4)	-	-	-	-	--	-	-	-	-	-	-
45-50	4(8)	-	-	-	-	-	-	-	-	-	-	-
50-55	-	-	-	-	-	-	-	-	-	-	-	-
>55	8(16)	-	-	-	-	-	-	-	-	-	-	-
Total	50(100)	50(100)	50(100)	50(100)	50(100)	50(100)	50(100)	50(100)	50(100)	50(100)	50(100)	50(100)

(Figures in parenthesis are percentages)

Table 15. Monthly expenditure pattern of the respondents in experimental group (n=100)

Percentage of income	Food	Clothing	Shelter	Transport	Recreation	Education	Electricity	Health	Luxury	Remittance	Savings	Fuel
Nil	-	-	-	-	-	63	4	-	-	22	78	40
<5	-	88	100	40	98	22	78	92	93	-	22	37
5-10	-	12	-	48	2	15	18	8	7	17	-	23
10-15	-	-	-	8	-	-	-	-	-	2	-	-
15-20	2	-	-	2	-	-	-	-	-	8	-	-
20-25	-	-	-	2	-	-	-	-	-	12	-	-
25-30	-	-	-	-	-	-	-	-	-	17	-	-
30-35	3	-	-	-	-	-	-	-	-	13	-	-
35-40	5	-	-	-	-	-	-	-	-	8	-	-
40-45	15	-	-	-	-	-	-	-	-	-	-	-
45-50	20	-	-	-	-	-	-	-	-	1	-	-
50-55	15	-	-	-	-	-	-	-	-	-	-	-
>55	40	-	-	-	-	-	-	-	-	-	-	-
Total	100	100	100	100	100	100	100	100	100	100	100	100

About 40 per cent of the families in the control group saved less than 10 per cent of their income, where as 22 per cent in experimental group saved less than 5 per cent of their monthly income.

4.1.16. Housing conditions

Details of housing conditions of the families are presented in Table 16.

Majority of the families in control group (98%) and in experimental group (97%) resided in their own houses. All the houses in both groups were built with bricks as the wall material and majority of houses in control (70%) and experimental groups (59%) had tiled roofs. Majority of the houses in control (84%) and experimental groups (83%) had 2 to 3 rooms. All the houses in both groups had separate kitchen and majority were having proper lavatory facilities in their houses.

Majority of the families in control (94%) and experimental groups (87%) had their own well. About 4 per cent (control) and 9 per cent (experimental) families depended on public tap for water. About 2 per cent and 3 per cent of the families in both groups used public well as source of drinking water.

Regarding the drainage facilities in the houses majority of the families in the control (88%) and experimental (83%) groups had no proper drainage facilities. Except 6 per cent and 5 per cent of the families in control and experimental groups all the other families had electricity facilities.

All the families in control and experimental groups had recreational facilities in their home. Regarding the transport facilities majority had proper transport facilities in their locality.

Table 16. Housing conditions of the families

Sl. No.	Facilities	Number of families	
		Control (n=50)	Experimental (n=100)
1	Type of house		
	Own	49 (98)	97
	Rented	1 (2)	3
2	Type of wall		
	Mud built	-	-
	Brick built	50 (100)	100
3	Roofing material		
	Thatched	2 (4)	3
	Tiled	35 (70)	59
	Terraced	13 (26)	38
4	Number of rooms		
	2	27 (54)	31
	3	15 (30)	52
	4	3 (6)	12
	5	5 (10)	5
5	Separate kitchen	50 (100)	100
6	Source of drinking water		
	Own well	47 (94)	87
	Public tap	2 (4)	9
	Public well	1 (2)	3
	River	-	1
7	Lavatory facilities		
	Own latrine	49 (98)	97
	Public latrine	1 (2)	3
8	Drainage facilities		
	Open drainage	3 (6)	7
	Closed	3 (6)	10
	None	44 (88)	83
9	Electrical facilities		
	Present	47 (94)	95
	Absent	3 (6)	5
10	Recreational facilities	50 (100)	100
11	Transport facilities		
	Bus	41 (82)	64
	Cycle	7 (14)	13
	Motor bike	2 (4)	23

4.1.17. Use of fuel

About 56 per cent of the families in control group and 79 per cent of families in experimental group used wood as the major source of fuel and only 30 per cent and 11 per cent of the families in control and experimental groups respectively used Liquid Petroleum Gas (LPG). About 2 per cent and 7 per cent of the families used bio gas produced from cow dung and 10 per cent of families in control group used kerosene also as the source of fuel.

Majority of the families in control group (94%) and experimental groups (83%) purchased fuel from outside and only 6 per cent and 17 per cent of the families collected wood and agricultural waste for fuel from surroundings. The details are presented in Table 17.

Table 17. Details regarding type and source of fuel

Sl. No.	Details	Number of families	
		Control (n=50)	Experimental (n=100)
1	**Type of fuel**		
	Wood	28 (56)	79
	Agricultural waste	1 (2)	3
	Cow dung	1 (2)	7
	Kerosene	5 (10)	-
	LPG	15 (30)	11
2	**Source of fuel**		
	Collected from surroundings	3 (6)	17
	Purchased	47 (94)	83

4.1.18. Details of health care facilities

In control and experimental groups 58 per cent and 57 per cent depended on Primary Health Center in the locality for medical care. About 22 per cent (control) and 21 per cent (experimental) of the families depended on private hospital. Only 12 per cent and 9 per cent of the families used the facilities available in medical college for this purpose, while a minority depended on ayurvedic and homeopathic services also. Details are provided in Table 18.

Table 18. Details regarding use of health care facilities

Sl. No.	Type of health facilities	Number of families	
		Control (n=50)	Experimental (n=100)
1	Primary health center	29 (58)	57
2	Private hospital	11 (22)	21
3	Medical college	6 (12)	9
4	Ayurvedic	2 (4)	11
5	Homeopathic	2 (4)	2

4.1.19. Epidemics prevalent in the locality

Prevalence of any type of epidemics was not reported in the locality during the past one year.

4.1.20. Mode of commutation

All the families in both control and experimental groups used bus as the main mode of commutation.

4.2. PERSONAL HABITS AND WORKING PATTERN OF THE RESPONDENTS

4.2.1. Personal habits of the respondents

Details regarding personal habits of the respondents are presented in Table 19.

From the Table, it is clear that in control and experimental groups 24 per cent and 64 per cent male respondents respectively had the habit of smoking. Tobacco chewing was practiced by 24 per cent male and 12 per cent female respondents of control group and 46 per cent and 50 per cent in experimental group. Alcohol consumption was found only among 40 per cent and 56 per cent male respondents in control and experimental groups respectively.

Table 19. Details regarding personal habits of respondents

Sl. No.	Details	Number of respondents			
		Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
1	Smoking				
	Present	6 (24)	-	32 (64)	-
	Absent	19 (76)	25 (100)	18 (36)	50 (100)
2	Tobacco chewing				
	Present	6 (24)	3 (12)	23 (46)	25 (50)
	Absent	19 (76)	22 (88)	27 (54)	25 (50)
3	Alcohol consumption				
	Present	10 (40)	-	28 (56)	-
	Absent	15 (60)	25 (100)	22 (44)	50 (100)

(Figures in parenthesis are percentages)

4.2.2. Exercise

It was seen that 16 per cent and 36 per cent of the male and female respondents in control group used to take regular physical exercise daily while in experimental group it was found only among 12 per cent of male and 10 per cent of female respondents. The details are presented in Table 20.

Table 20. Details regarding exercise of the respondents

Details	Number of respondents			
	Control		Experimental	
	Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
Type of exercise				
Walking	4 (16)	9 (36)	6 (12)	5 (10)
Swimming	-	-	1 (2)	-
Cycling	3 (12)	-	6 (12)	-
Yoga	-	-	-	-
Nil	18 (72)	16 (64)	37 (74)	45 (90)
Duration				
Daily	7 (100)	9 (100)	13 (100)	5 (100)

(Figures in parentheses are percentages)

4.2.3. Time expenditure pattern of the respondents

The details of time spent for different activities by the respondents are presented in Table 21.

Table 21. Details regarding time expenditure pattern of the respondents

Sl. No.	Details	Number of respondents			
		Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
1	Time spent for household activities (hr)				
	5-6	1 (4)	4 (16)	9 (18)	7 (14)
	6-7	19 (76)	17 (68)	37 (74)	41 (82)
	7-8	4 (16)	3 (12)	4 (8)	2 (4)
	>8	1 (4)	1 (4)	-	-
2	Time spent for sleep (hr)				
	5-6	1 (4)	2 (8)	3 (6)	6 (12)
	6-7	10 (40)	17 (68)	29 (58)	30 (60)
	7-8	14 (56)	6 (24)	15 (30)	11 (22)
	>8	-	-	3 (6)	3 (6)
3	Time spent at work site (hr)				
	6-7	25 (100)	25 (100)	50 (100)	50 (100)

(Figures in parentheses are percentages)

About 76 per cent male and 68 per cent of female respondents in control group and 74 per cent male and 82 per cent of female respondents in experimental group spent 6-7 hours daily for house hold activities. Only 16 per cent (male) and 12 per cent (female) respondents in control group spent 7-8 hours for this purpose while in experimental group it was 8 per cent and 4 per cent respectively.

Regarding the time spent for sleep, 40 per cent and 68 per cent of male and female respondents in control group slept for 6-7 hours daily and in experimental group

it was 58 per cent and 60 per cent respectively. About 56 per cent (male) and 24 per cent (female) in control group and 30 per cent (male) and 22 per cent (female) respondents in experimental group slept for 7-8 hours daily.

All respondents in control and experimental groups indicated that they spent 6 -7 hours daily in work site.

4.2.4. Working pattern of the respondents

From Table 22, it is clear that majority of the respondents in control group (84% and 88%) and in experimental group (74% and 78%) worked for 6 days in a week. The rest of the respondents used to get work for 5 days in a week. It was also observed that all respondents in both groups worked for 6-7 hours daily with an interval of three hours daily. The wage per day was found to be Rs. 200.

Considering the details regarding the work during different seasons it was observed that both groups used to get about 25-26 days of work during summer as well as rainy seasons.

About 40 per cent of the male respondents also indicated that they used to get other work during off days also. It was also observed that women labourers in both groups were not going for any other work during off days.

Table 22. Details on the working pattern of the respondents

Sl. No.	Details	Number of respondents			
		Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
1	Frequency of work in a week (days)				
	5	4 (16)	3 (12)	13 (26)	11 (22)
	6	21 (84)	22 (88)	37 (74)	39 (78)
2	Working time (hours)				
	6-7	25 (100)	25 (100)	50 (100)	50 (100)
3	Interval (hours)				
	3	25 (100)	25 (100)	50 (100)	50 (100)
4	Work during summer seasons				
	25-26	25 (100)	25 (100)	50 (100)	50 (100)
5	Rainy seasons				
	25-26	25 (100)	25 (100)	50 (100)	50 (100)

(Figures in parentheses are percentages)

4.3. FOOD CONSUMPTION PATTERN OF THE RESPONDENTS

The food consumption pattern of the respondents was assessed with respect to the food habit, staple food, frequency of use of different food items, meal pattern, foods avoided and specially included and use of pappad, pickle, oil and fried food items. The details are given from 4.3.1 to 4.3.5.

4.3.1. Food habit and staple food

From Table 23, it is clear that majority of the respondents in control (96% and 84%) and experimental (84% and 86%) groups were non- vegetarians and rest of respondents followed vegetarian food habit. All respondents surveyed were found to be consuming rice as their staple food.

Table. 23. Food habit of the respondents

Sl. No.	Food habit	Number of respondents			
		Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
1	Vegetarians	1 (4)	4 (16)	8 (16)	7 (14)
2	Non-vegetarians	24 (96)	21 (84)	42 (84)	43 (86)

(Figures in parenthesis are percentages)

4.3.2. Frequency of use of different food items

The details of frequency of use of various food items by the respondents in the two groups are presented in Table 24 and 25.

All the respondents in control and experimental groups used cereals, fats and oils, sugar, spices and condiments, milk and milk products in their daily diet. In control and experimental groups 48 per cent and 44 per cent of the respondents consumed pulses twice in a week while 36 per cent and 32 per cent of the respondents consumed vegetables thrice in a week. Green leafy vegetables were included once in a week by 24 per cent of the respondents in control and 51 per cent in experimental groups. Fifty two per cent of respondents in control group and 49 per cent in experimental group included fruits once in a week. Fish was included daily by 98 per cent and 99 per cent of the

Table 24. Frequency of use of various food items by the respondents in control group (n=50)

Food groups	D	W_3	W_2	W_1	M	O	N
Cereals	50(100)	-	-	-	-	-	-
Pulses	-	6(12)	24(48)	18(36)	2(4)	-	-
Green leafy vegetables	-	-	-	12(24)	25(50)	13(26)	-
Other vegetables	26(52)	18(36)	6(12)	-	-	-	-
Roots and tubers	-	4(8)	7(14)	10(20)	24(48)	5(10)	-
Fruits	-	-	-	26(52)	7(14)	14(28)	3(6)
Fats and oils	50(100)	-	-	-	-	-	-
Sugar	50(100)	-	-	-	-	-	-
Spices and condiments	50(100)	-	-	-	-	-	-
Milk and milk products	50(100)	-	-	-	-	-	-
Meat	-	2(4)	19(38)	18(36)	9(18)	1(2)	1(2)
Fish	49(98)	-	-	-	-	1(2)	-
Egg	1(2)	-	-	-	40(80)	8(16)	1(2)

(Figures in parenthesis are percentages)

Table 25. Frequency of use of various food items by the respondents in experimental group (n=100)

Food groups	D	W_3	W_2	W_1	M	O	N
Cereals	100	-	-	-	-	-	-
Pulses	-	12	44	39	5	-	-
Green leafy vegetables	-	-	25	51	26	-	-
Other vegetables	50	32	17	1	-	-	-
Roots and tubers	-	7	15	19	44	7	-
Fruits	-	-	-	49	17	29	5
Fats and oils	100	-	-	-	-	-	-
Sugar	100	-	-	-	-	-	-
Spices and condiments	100	-	-	-	-	-	-
Milk and milk products	100	-	-	-	-	-	-
Meat	-	7	36	32	17	3	5
Fish	99	1	-	-	-	-	-
Egg	1	1	-	-	80	15	3

D- Daily, W_3- weekly thrice, W_2- weekly twice, W_1- weekly once, M- Monthly, O- Occasionally, N- Never

respondents in control and experimental groups respectively. Eighty per cent respondents of control and experimental groups included egg once in a month.

The frequency of use of different food items among the respondents in both groups was assessed by the formula suggested by Reaburn *et al.* (1979) and the percentage scores are presented in Table 26.

The results indicated that the maximum score of 100 per cent was obtained for food items like cereals, fats and oils, sugar, spices and condiments and milk and milk products among control and experimental groups. The food frequency score obtained for pulses, green leafy vegetables and other vegetables was found to be 78 per cent 65 per cent and 90 per cent respectively in control group when compared to 64 per cent 52 per cent and 87 per cent respectively in experimental group. In the case of roots and tubers, fruits, egg and meat experimental group scored 68 per cent, 74 per cent, 51 per cent and 65 per cent when compared to 56 per cent, 59 per cent, 30 per cent and 63 per cent in control group.

Based on the percentage scores obtained for different items, the foods were classified into three groups viz., most frequently used (percentage score above 75%), medium frequently used (percentage score in the range of 50 to 75%) and less frequently used (percentage score below 50%) food stuffs.

It was seen that cereals, other vegetables, fats and oils, sugar, spices and condiments, milk and milk products and fish were the most frequently used food items in both groups. Green leafy vegetables, roots and tubers, fruits and meat were found to be the medium frequently used food among both groups. Egg was the less frequently used food item in control group. (Table 27)

Table 26. Frequency score (%) of different food items

Food items	Control	Experimental
Cereals	100	100
Pulses	78	64
Green leafy vegetables	65	52
Other vegetables	90	87
Roots and tubers	56	68
Fruits	59	74
Fats and oils	100	100
Sugar	100	100
Spices and condiments	100	100
Milk and milk products	100	100
Meat	63	65
Fish	97	98
Egg	30	51

Table 27. Details of frequency of use of different food items

Frequency of use	Control	Experimental
Most frequently used (Scores above 75%)	Cereals, pulses, other vegetables, fats and oils, spices and condiments, sugar, milk and milk products and fish	Cereals, other vegetables, fats and oils, spices and condiments, sugar, milk and milk products and fish
Medium frequently used (Scores 50-75%)	Green leafy vegetables, roots and tubers, fruits and meat	Pulses, green leafy vegetables, roots and tubers, fruits, meat and egg
Less frequently used (Scores below 50%)	Egg	-

4.3.4. Meal pattern of the respondents

The analysis of the meal pattern of the respondents indicated that majority of the respondents in control group (82%) and experimental group (97%) had three major meals a day. Majority of the respondents (89 to 98 per cent) planned their meals in advance. Details are given in Table 28.

Table 28. Details of meal pattern

Sl. No.	Details	Number of respondents	
		Control (n=50)	Experimental (n=100)
1	Frequency of meals (daily)		
	3	41 (82)	97
	>3	9 (18)	3
2	Meal planning		
	Plan meals in advance	49 (98)	89
	No meal planning	1 (2)	11

4.3.5. Use of specific food items by the respondents

The details on the use of oil, pickle, pappads, dry fish and fried food items are presented in Table 29.

From the Table it is clear that 88 per cent and 80 per cent of respondents in control group and 98 per cent of respondents in experimental group used coconut oil as the medium of cooking. Rest of the respondents used vegetable oil for cooking.

Table 29. Details regarding use of oil, pickles, dried fish, pappd and fried food items

Sl. No.	Details	Number of respondents			
		Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
1	**Oil**				
	Coconut oil	22 (88)	20 (80)	49 (98)	49 (98)
	Vegetable oil	3 (12)	5 (20)	1 (2)	1 (2)
2	**Pickle**				
	Used daily	12 (48)	9 (36)	43 (86)	45 (90)
	Used occasionally	13 (52)	16 (64)	7 (14)	5 (10)
3	**Dry fish**				
	Used daily	4 (16)	7 (28)	39 (78)	37 (74)
	Used occasionally	21 (84)	18 (72)	11 (22)	13 (26)
4	**Pappad**				
	Used daily	10 (40)	14 (56)	41 (82)	43 (86)
	Used occasionally	15 (60)	11 (44)	9 (18)	7 (14)
5	**Fried food items**				
	Daily	6 (24)	8 (32)	15 (30)	18 (36)
	Weekly once	2 (8)	1 (4)	4 (8)	9 (18)
	Weekly thrice	3 (12)	4 (16)	5 (10)	7 (14)
	Monthly	1 (4)	3 (12)	13 (26)	10 (20)
	Occasionally	13 (52)	9 (36)	13 (26)	6 (12)

(Figures in parenthesis are percentages)

It was observed that only 48 per cent and 36 per cent of male and female respondents of control group used pickles daily while in experimental group 86 per cent and 90 per cent of male and female respondents respectively used pickles daily. With respect to the use of dried fish it was seen that 16 per cent and 28 per cent of male and female respondents in control group and 78 per cent and 74 per cent in experimental group used dried fish daily. About 40 per cent and 56 per cent of respondents in control group and 82 per cent and 86 per cent of respondents in experimental group used pappad daily. Regarding the use of fried food items, 24 per cent of male and 32 per cent of female respondents in control group used fried food items daily but in experimental group it was 30 per cent and 36 per cent respectively.

It was also seen that the respondents neither imposed any diet restriction nor included any specific food items to control hypertension.

4.4. NUTRITIONAL STATUS OF THE RESPONDENTS

Nutritional status of the respondents was ascertained through anthropometric measurements and one day food weighment method.

4.4.1. Anthropometric measurements

4.4.1.1. Weight

Details regarding the weight of the respondents are presented in Table 30.

The weight of male respondents in control group varied from 46 to 70 kg, while in females the weight varied from 45 to 71 kg. In experimental group, weight of male respondents varied from 49 to 71 kg and female respondents it varied from 45 to 70 kg. Significant difference in the weight of male respondents was observed between control

and experimental groups. The difference observed in the weight of female respondents between the two groups was found to be insignificant.

Table 30. Distribution of respondents on the basis of weight

Weight (kg)	Number of respondents			
	Control		Experimental	
	Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
40-45	-	2 (8)	-	1 (2)
46-50	4 (16)	4 (16)	4 (8)	10 (20)
51-55	11 (44)	7 (28)	11 (22)	14 (28)
56-60	7 (28)	6 (24)	22 (44)	18 (36)
61-65	1 (4)	2 (8)	4 (8)	4 (8)
66-70	2 (8)	3 (12)	7 (14)	3 (6)
71-75	-	1 (4)	2 (4)	-

(Figures in parenthesis are percentages)

't' value between the groups (male) = 2.09**

't' value between the groups (female) = 0.53NS

4.4.1.2. Height

Details regarding height of the respondents are presented in Table 31.

The height of male respondents in control group varied from 145 to165 cm. In the case of female respondents the height varied from 145 to 165 cm. In experimental group the height of male and female respondents varied from 145 to 165 cm and 145 to 166 cm respectively. Statistically significant variation was observed in height of male respondents in two groups. In the case of females the variation was found to be insignificant.

Table 31. Distribution of respondents on the basis of height

Height (cm)	Number of respondents			
	Control		Experimental	
	Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
140.1-145	1 (4)	1 (4)	3 (6)	1 (2)
145.1-150	3 (12)	2 (8)	9 (18)	6 (12)
150.1-155	6 (24)	7 (28)	13 (26)	5 (10)
155.1-160	8 (32)	9 (36)	17 (34)	22 (44)
160.1-165	7 (28)	6 (24)	8 (16)	15 (30)
165.1-170	-	-	-	1 (2)

(Figures in parenthesis are percentages)

't' value between the groups (male) = 1.08**

't' value between the groups (female) = 1.22 NS

4.4.1.3. Body mass index of respondents

The respondents were categorized on the basis of their Body Mass Index (BMI) which was computed from their weight and height measurements. The respondents were graded into different categories on the basis of the classification suggested by IOTF/ WHO (2000). The details are given in Table 32.

The results indicated that 8 per cent and 4 per cent of male and female respondents in control group were undernourished. About 60 per cent male and 48 per cent female respondents in control group and 30 per cent male and 64 per cent female respondents in experimental group had normal BMI in the range of 18.5 to 22.9. Only 16 per cent male and female respondents in control group and 28 per cent male and 16

per cent female respondents in experimental group were found to be at risk for obesity. Grade I obesity was found among 16 percent (male) and 32 per cent (female) respondents of control group and 38 per cent (male) and 16 per cent (female) respondents of experimental group. Only 2 per cent of male respondents of experimental group had BMI more than 30. Comparison of the BMI of male and female respondents of control and experimental groups are given in Figure 1 and 2 respectively.

Table 32. Distribution of respondents based on their body mass index

Category (BMI)	Number of respondents			
	Control		Experimental	
	Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
Undernourished (<18.5)	2 (8)	1 (4)	1 (2)	2 (4)
Normal (18.5-22.9)	15 (60)	12 (48)	15 (30)	32 (64)
At risk (23-24.9)	4 (16)	4 (16)	14 (28)	8 (16)
Grade I Obesity (25 - 29.9)	4 (16)	8 (32)	19 (38)	8 (16)
Obesity (> 30)	-	-	1 (2)	-

(Figures in parenthesis are percentages)

4.4.1.4 Waist and hip circumference

The waist circumference of male and female respondents in control group varied from 77 to 91 cm and 65 to 89 cm respectively. In experimental group the waist circumference of male and female respondents varied from 76 to 94 cm and 80 to 98 cm respectively.

Figure 1. Comparison of BMI of male respondents of control and experimental groups

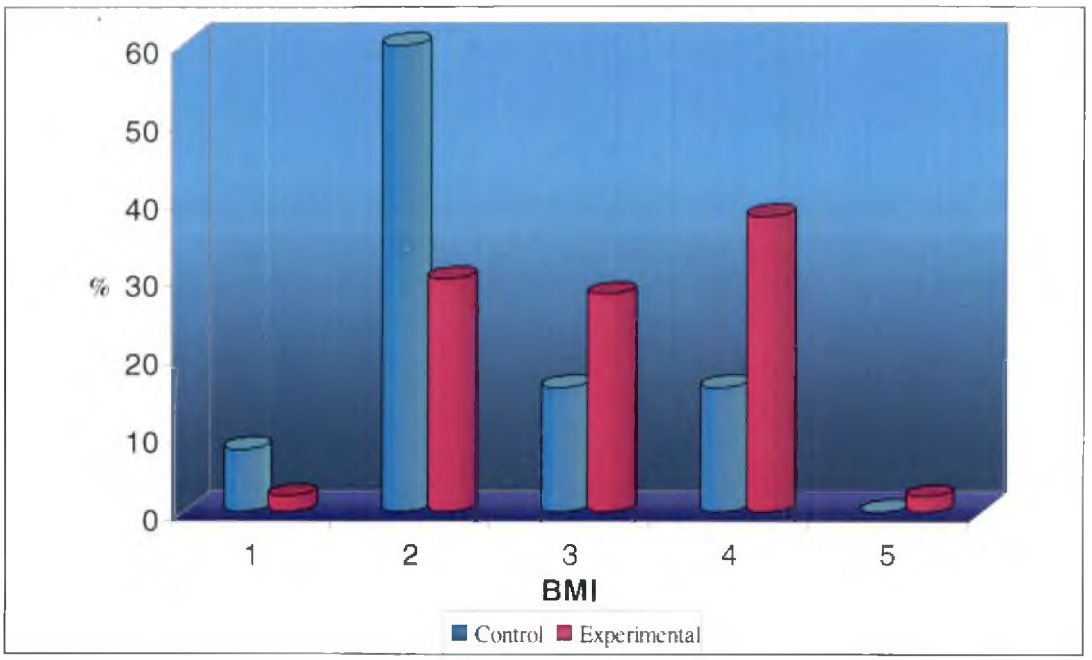
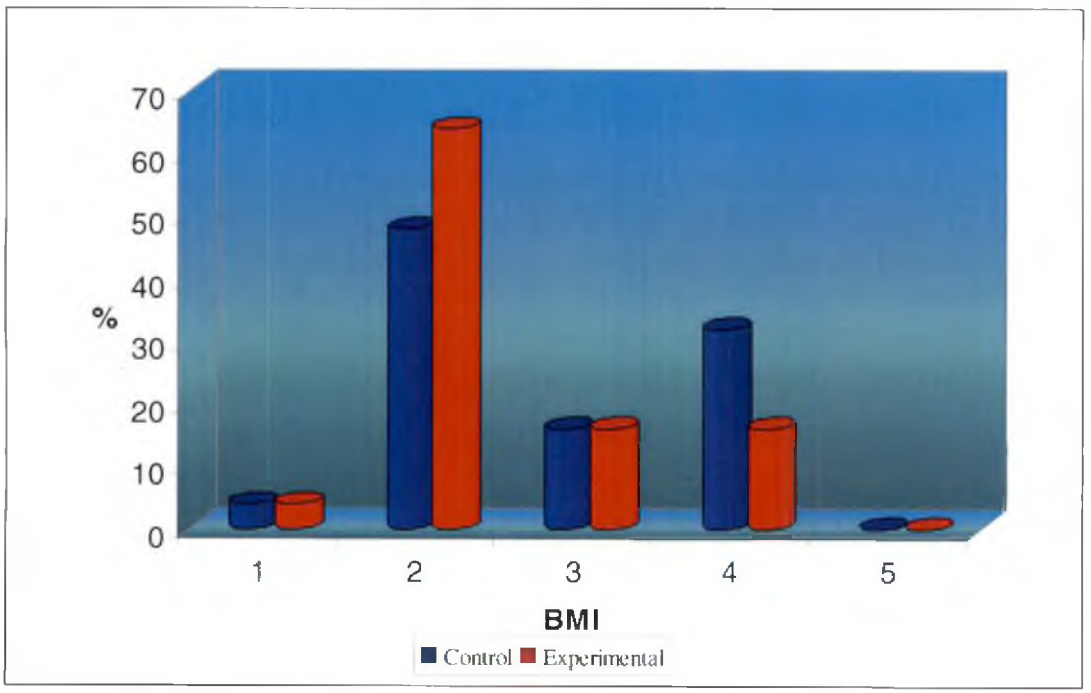


Figure 2. Comparison of BMI of female respondents of control and experimental groups



1- Undernourished, 2- Normal, 3- At risk, 4- Grade 1 obesity, 5- Obesity

Hip circumference of the respondents revealed that in control group the circumference of male respondents varied from 80 to 107 cm and in females 88 to 102 cm. In experimental group the hip circumference varied from 89 to 108cm (male) and 90 to 107 cm (female).

Distribution of respondents with respect to waist and hip circumference are given in Table 33.

From the Table, it is clear that the waist circumference of 36 per cent (male) and 60 per cent (female) respondents in control group varied from 71-80 cm and in experimental group it was 38 per cent and 6 per cent respectively. About 60 per cent and 36 per cent of male and female respondents in control group had waist circumference in the range of 81-90 cm and in experimental group it was 48 per cent and 60 per cent respectively. Statistically no significant variation was observed in waist circumference of male respondents between the control and experimental groups. But in the case of females significant difference was observed with respect to waist circumference between the two groups.

In the case of hip circumference, it was found that 24 per cent and 44 per cent male and female respondents in control group had circumference in between 81-90 cm and in experimental group it was 26 and 8 per cent respectively. The hip circumference in the range of 91-100 cm was found among 60 per cent and 48 per cent male and female respondents in control group and 64 per cent and 66 per cent in experimental group. Significant variation was observed in the hip circumference of female respondents between the control and experimental groups.

Table 33. Distribution of respondents on the basis of waist and hip circumference

Measurements (cm)	Number of respondents			
	Control		Experimental	
	Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
Waist circumference				
60-70	-	1 (4)	-	-
71-80	9 (36)	15 (60)	19 (38)	3 (6)
81-90	15 (60)	9 (36)	24 (48)	30 (60)
91-100	1 (4)	-	7 (14)	17 (34)
	't' value (male) = 0.38 NS 't' value (female) = 9.02*			
Hip circumference				
71-80	1 (4)	-	-	-
81-90	6 (24)	11 (44)	13 (26)	4 (8)
91-100	15 (60)	12 (48)	32 (64)	33 (66)
>100	3 (12)	2 (8)	5 (10)	13 (26)
	't' value (male) = 0.77 NS 't' value (female) = 3.67*			

(Figures in parenthesis are percentages)

4.4.1.5. Waist hip ratio

The waist hip ratio of male respondents in control group varied from 0.79 to 0.96 and in females the ratio varied from 0.73 to 0.98. In experimental group it was. in the range of 0.78 - 0.96 (male) and 0.74 to 0.98 (female). It was also found that about 92 per cent and 98 per cent male respondents in control and experimental groups respectively had waist hip ratio less than 0.95. Among female respondents 64 per cent and 84 per cent had a waist hip ratio more than 0.85 which is associated with risk among females (Sivakumar, 2000). Among male respondents only 8 per cent in control group and 2 per cent in experimental group had a ratio of more than 0.95 which is

associated with risk among males (Sivakumar, 2000). The details are presented in Table 34.

Table 34. Distribution of respondents on the basis of waist hip ratio

Waist hip ratio		Number of respondents			
Male	Female	Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
<0.95	<0.85	23 (92)	9 (36)	49 (98)	8 (16)
>0.95	>0.85	2 (8)	16 (64)	1 (2)	42 (84)

(Figures in parenthesis are percentages)

4.4.2. Food weighment survey

4.4.2.1. Actual food and nutrient intake

An indepth study among 15 agricultural labourers comprising of 10 from experimental group and 5 from control group in each sex was conducted by one day food weighment method to determine the actual food and nutrient intake and to assess the quality and quantity of the foods consumed by the respondents.

The quantity of each food item was compared with the quantity specified for a balanced diet suggested by ICMR (1984) for heavy activity. The nutrients were compared with the Recommended Dietary Allowances (RDA) of nutrients for men and women engaged in heavy activity suggested by ICMR (1990). Both the food and nutrient intake of respondents were statistically analysed. The results are furnished in Table 35, 36, 37 and 38.

4.4.2.2. Food intake

The mean food intake of male and female respondents assessed by one day food weighment method indicated that the mean intake of all food items was lower than the recommended allowances in both male and female respondents of control and experimental groups. In control group the intake of all food items except pulses among female respondents and green leafy vegetables and fats and oils among male respondents was found to be significantly lower than the RDA. In experimental group also, the intake of all food groups except pulses and other vegetables among female respondents was also found to be significantly lower than the RDA. Significant variation was observed in the intake of pulses, flesh foods, fats and oils, and sugar among male respondents and pulses, flesh foods and sugar among female respondents of two groups. The details are given in Table 35 and 36. The comparison of the food intake of male and female respondents of control and experimental groups are given in Figure 3 and 4 respectively.

4.4.2.3. Nutrient intake

The mean intake of nutrients by the male and female respondents was computed from the quantity of the food consumed and compared with the RDA suggested by ICMR (1990). The details are furnished in Table 37 and 38.

The intake of all nutrients was found to be lower than the recommended levels among male and female respondents in control and experimental groups. Among the female respondents the decrease was found to be statistically significant with respect to all nutrients except vitamin C in control group and retinol and fat in experimental group. Among male respondents of experimental group also the decrease was found to be statistically significant for all nutrients. Significant difference in the intake of calcium, retinol, niacin and vitamin C was found among the male respondents of the

Table 35. Comparison of the mean food intake of male respondents in control and experimental groups

Food items	RDA (g)	Control (n=5)			Experimental (n=10)			t value between the groups
		Mean(g) ±SE	% of RDA	t value	Mean(g) ±SE	% of RDA	t value	
Cereals	670	376.07±4.42	56.12	10.07**	323.41±3.12	48.27	0.89NS	1.68NS
Pulses	30	18.4±3.03	61.33	12.18**	14.5±3.01	48.33	1.76NS	4.4**
Green leafy vegetables	40	24±5.85	60	1.20NS	21±4.85	52.5	1.42NS	3.30NS
Other vegetables	80	18±1.75	22.5	4.07**	17.1±4.87	21.37	3.73**	3.25NS
Roots and tubers	80	23.18±4.12	28.97	5.77**	21.71±1.9	27.13	1.01NS	0.54NS
Fruits	30	3.67±2.11	12.23	12.49**	9.07±3.45	30.23	0.52NS	0.417NS
Milk and milk products	250	23±6.1	9.2	47.47**	9.18±4.51	3.67	5.1**	0.34NS
Flesh foods	30	7.5±5.52	25	2.18*	8.41±1.87	28.03	2.18*	0.030**
Fats and oils	70	2.23±0.164	3.18	0.87NS	3.73±2.81	5.32	1.95NS	1.93**
Sugar	55	34±5.4	61.8	4.23**	31.12±5.12	56.5	4.34**	0.17**

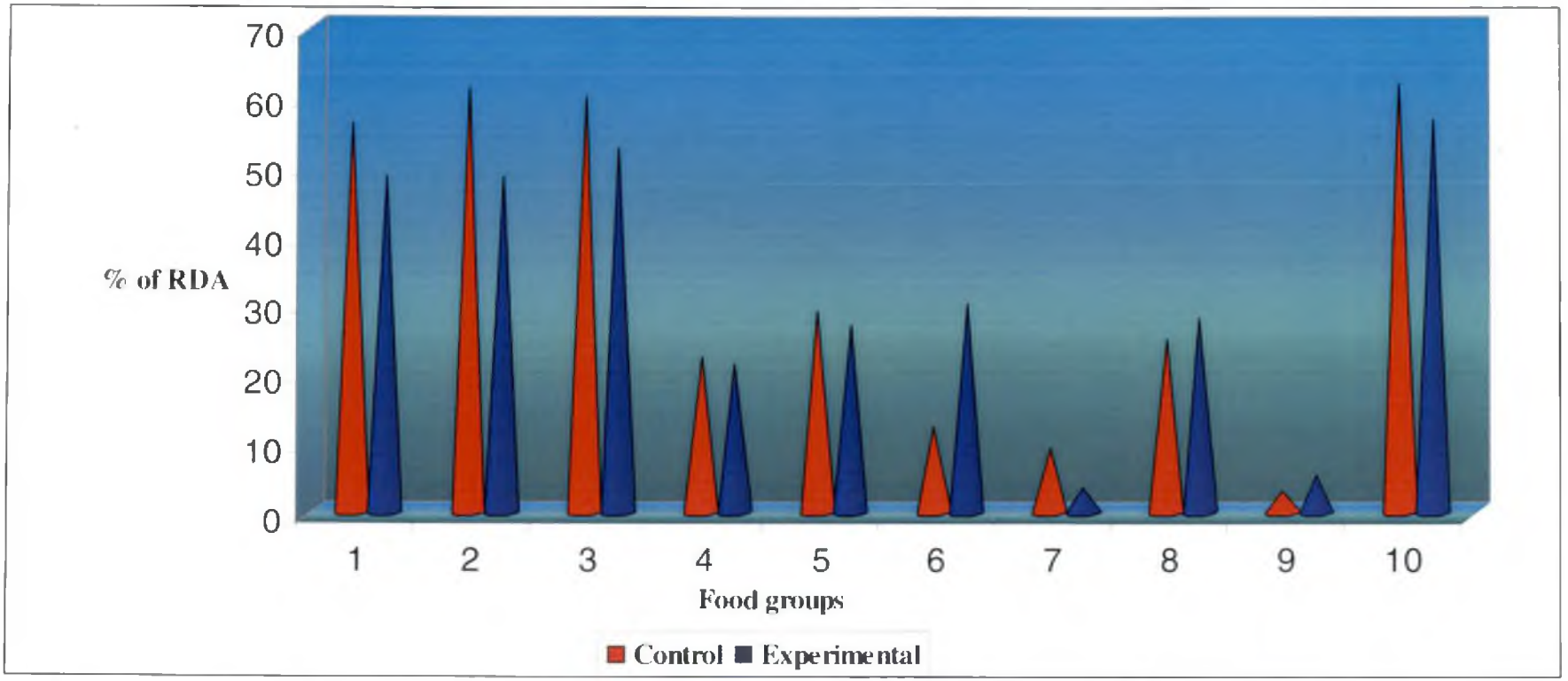
** Significant at 1%level
* Significant at 5% level
NS Not Significant

Table 36. Comparison of the mean food intake of female respondents in control and experimental groups

Food items	RDA (g)	Control (n=5)			Experimental (n=10)			t value between the groups
		Mean(g) ±SE	% of RDA	t value	Mean(g) ±SE	% of RDA	t value	
Cereals	575	317.19±31.1	55.16	17.17**	297.12±12.07	51.67	10.12**	1.59NS
Pulses	25	17.31±1.29	69.24	1.41NS	16.17±6.8	64.68	1.20NS	4.6**
Green leafy vegetables	100	18.72±3.10	18.72	9.47**	11.38±3.81	11.38	10.78**	3.39NS
Other vegetables	50	41.38±8.12	82.76	2.09*	40.17±8.16	80.34	0.11NS	3.3NS
Roots and tubers	60	12.76±8.15	21.26	5.13**	21.98±7.12	36.63	9.36**	0.53NS
Fruits	30	3.15±3.21	10.5	13.18**	2.75±1.81	9.16	9.18**	0.42NS
Milk and milk products	200	98.13±10.81	49.06	31.78**	58.37±30.12	29.18	10.07**	0.33NS
Flesh foods	30	21.78±7.55	72.6	5.18**	18.13±4.39	60.43	8.17**	0.29**
Fats and oils	45	17.39±6.12	38.64	17.14**	12.18±9.08	27.06	117.18*	1.68NS
Sugar	40	39.17±11.9	97.92	3.16*	37.15±1.78	92.87	8.17**	0.162**

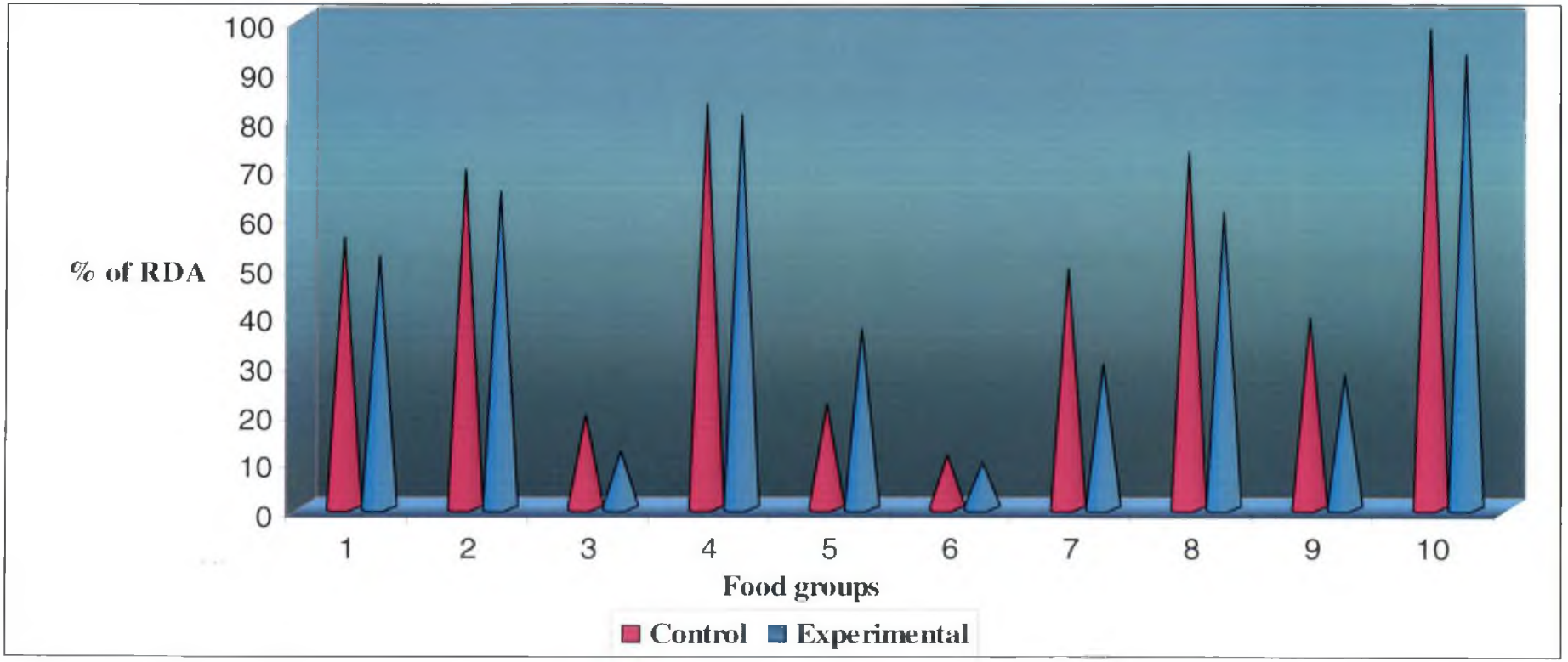
** Significant at 1%level
* Significant at 5% level
NS Not Significant

Figure 3. Comparison of the mean food intake of male respondents of control and experimental groups



1- Cereals 2- Pulses 3- Green leafy vegetables 4- Other vegetables 5- Roots and tubers 6- Fruits 7- Milk and milk products 8- Flesh foods 9- Fats and oils 10- Sugar

Figure 4. Comparison of the mean food intake of female respondents of control and experimental groups



1- Cereals 2- Pulses 3- Green leafy vegetables 4- Other vegetables 5- Roots and tubers 6- Fruits 7- Milk and milk products 8- Flesh foods 9- Fats and oils 10- Sugar

Table 37. Comparison of the mean nutrient intake of male respondents in control and experimental groups

Nutrients	RDA	Control (n=5)			Experimental (n=10)			t value between the groups
		Mean ±SE	% of RDA	t value	Mean ±SE	% of RDA	t value	
Energy (Kcal)	3200	1532.11±25.22	47.87	19.09**	1453.37±27.8	45.41	17.69**	0.88NS
Protein (g)	60	44.31±6.86	73.85	1.99NS	25±2.195	41.66	11.25**	0.71NS
Fat (g)	20	13.70±2.33	68.5	0.349NS	14.24±1.22	71.2	4.912NS	0.174NS
Calcium (mg)	400	270.80±1.84	67.7	3.2**	93±13.63	23.25	22.53**	3.19*
Iron (mg)	28	17.78±0.35	63.5	3.29**	5.93±1.038	21.17	23.19**	0.75NS
Retinol (µg)	600	360.37±85.9	60.06	0.14NS	224±102.70	37.33	3.66**	2.20**
Thiamin (mg)	1.6	0.67±1.07	41.87	0.7NS	0.69±0.045	43.12	9.11**	0.71NS
Riboflavin (mg)	1.9	0.40±0.08	21.05	3.33*	0.22±0.026	11.57	41.54**	1.30NS
Niacin (mg)	21	10.40±1.37	49.52	1.02NS	11.31±0.62	53.85	4.29**	3.30**
Vitamin C (mg)	40	25.09±6.67	62.7	2.96*	19±5.05	47.5	4.23**	2.14**

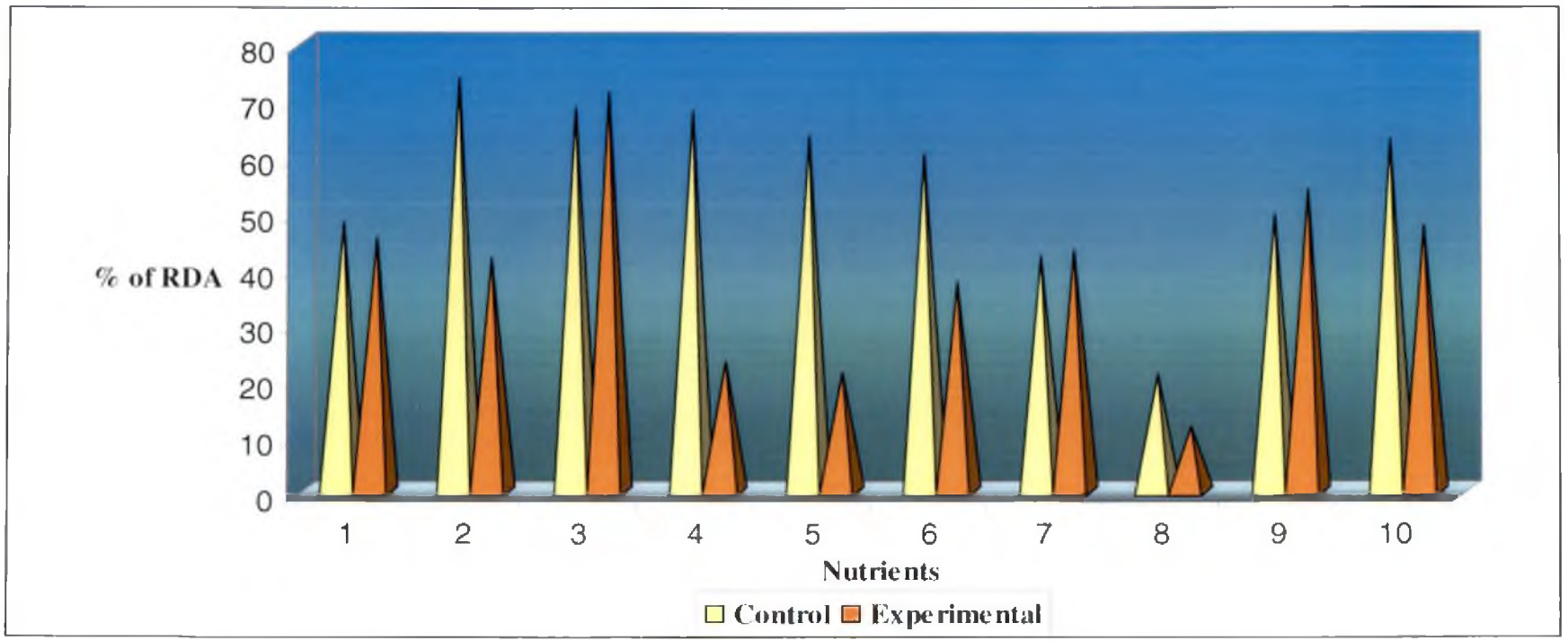
** Significant at 1%level
* Significant at 5% level
NS Not Significant

Table 38. Comparison of the mean nutrient intake of female respondents in control and experimental groups

Nutrients	RDA	Control (n=5)			Experimental (n=10)			t value between the groups
		Mean ±SE	% of RDA	t value	Mean ±SE	% of RDA	t value	
Energy (Kcal)	2450	1425.09±26.77	58.16	25.14**	1359.87±31.9	55.50	31.17**	0.80NS
Protein (g)	50	31.41±1.02	62.82	14.12**	29.42±1.89	58.84	32.95**	0.69NS
Fat (g)	20	12.26±2.12	61.3	3.14**	13.29±0.59	66.45	1.32NS	1.39NS
Calcium (mg)	400	261.09±1.049	65.27	19.03**	217.36±0.05	54.34	21.14**	2.73NS
Iron (mg)	30	11.12±0.012	37.06	71.12**	9.13±1.012	30.43	11.16**	0.74NS
Retinol (µg)	600	239.13±75.13	39.85	4.19*	229.19±49.09	38.19	2.28NS	2.04**
Thiamin (mg)	1.2	0.79±0.01	65.83	14.12**	0.71±0.02	59.16	5.18**	0.74NS
Riboflavin (mg)	1.5	0.81±0.08	54	11.92**	0.91±1.01	60.66	15.21**	1.38NS
Niacin (mg)	16	12.18±1.41	76.12	3.18*	10.73±0.42	67.06	9.87**	2.81**
Vitamin C (mg)	40	29.12±7.87	72.8	1.04NS	18.13±3.01	45.32	9.17**	2.25**

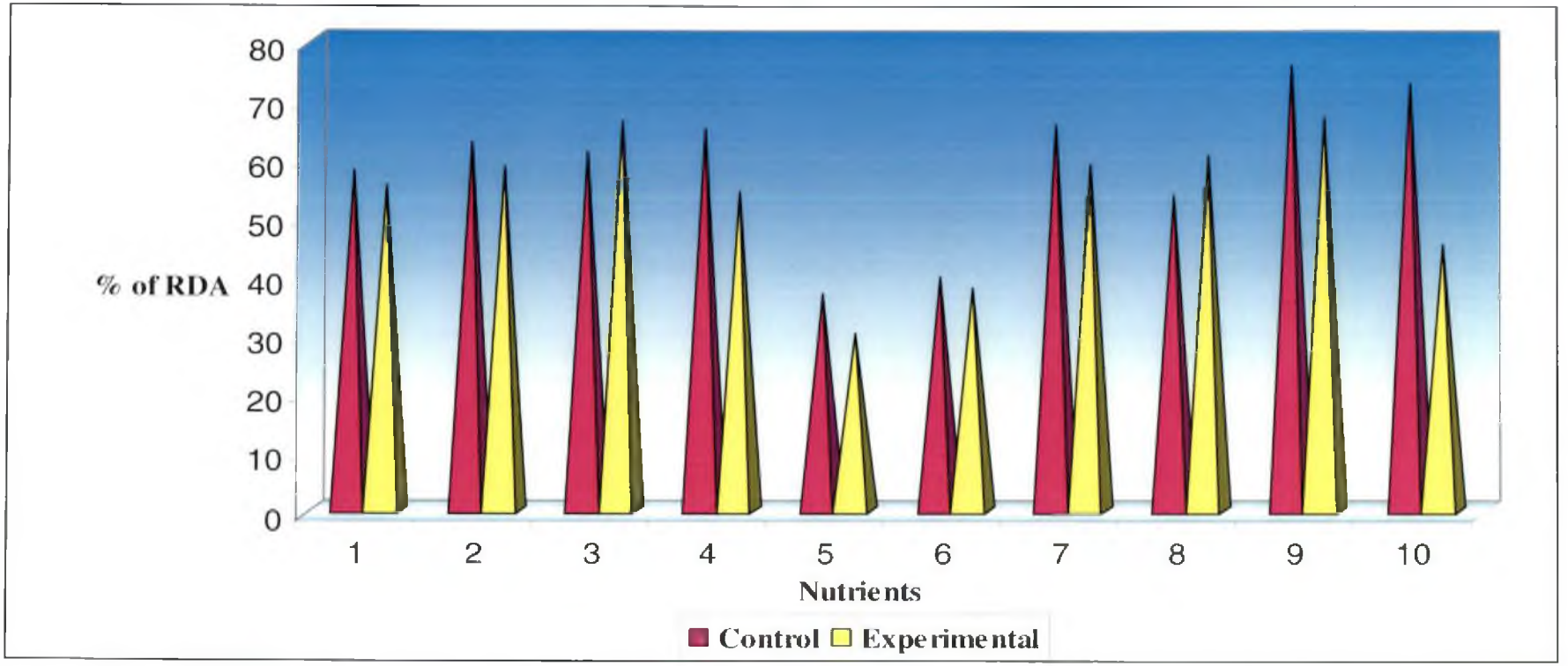
** Significant at 1%level
* Significant at 5% level
NS Not Significant

Figure 5. Comparison of the mean nutrient intake of male respondents of control and experimental groups



1- Energy 2- Protein 3- Fat 4- Calcium 5- Iron 6- Retinol 7- Thiamin 8- Riboflavin 9- Niacin 10- Vitamin C

Figure 6. Comparison of the mean nutrient intake of female respondents of control and experimental groups



1- Energy 2- Protein 3- Fat 4- Calcium 5- Iron 6- Retinol 7- Thiamin 8- Riboflavin 9- Niacin 10- Vitamin C

two groups. In the case of females the difference was found to be statistically significant in the case of retinol, niacin and vitamin C. The comparison of the nutrient intake of male and female respondents of control and experimental groups are given in Figure 5 and 6 respectively.

4.5. PREVALENCE AND RISK FACTORS FOR HYPERTENSION

4.5.1. Distribution of agricultural labourers on the basis of systolic and diastolic blood pressure

The distribution of male and female agricultural labourers on the basis of systolic and diastolic blood pressure is given in Table 39 & 40 and in Figure 7 & 8.

The systolic blood pressure of 95 male and 105 female agricultural labourers selected initially for the study varied from 99 to 154 mm Hg in males and 98 to 155 mm Hg in females. The diastolic blood pressure varied from 62 to 98 mm Hg in males and 63 to 98 mm Hg in females.

The systolic blood pressure of 29.48 per cent of male and 36.19 per cent of female agricultural labourers varied from 100 to 120 mm Hg. The systolic blood pressure of 69.47 per cent male and 61.91 per cent female agricultural labourers was found to be in the range of 120 to 155 mm Hg.

With respect to diastolic blood pressure 30.53 per cent male and 24.77 per cent female labourers were having diastolic blood pressure in the range of 70 to 80 mm Hg. The diastolic blood pressure in the range of 81 to 98 mm Hg was found among 62.10 per cent and 61.90 per cent male and female respondents respectively.

Table 39. Distribution of agricultural labourers on the basis of systolic blood pressure

Systolic blood pressure (mm Hg)	Male (n=95)	Female (n=105)
<100	1(1.05)	2 (1.90)
100-110	14 (14.74)	16 (15.24)
111-120	14 (14.74)	22 (20.95)
121-130	14 (14.74)	11 (10.48)
131-140	17 (17.89)	15 (14.29)
141-150	26 (27.37)	31 (29.52)
151-160	9 (9.47)	8 (7.62)

(Figures in parenthesis are percentages)

Table 40. Distribution of agricultural labourers on the basis of diastolic blood pressure

Diastolic blood pressure (mm Hg)	Male (n=95)	Female (n=105)
<70	7 (7.37)	14 (13.33)
70-80	29 (30.53)	26 (24.77)
81-90	24 (25.26)	44 (41.90)
91-100	35 (36.84)	21 (20)

(Figures in parenthesis are percentages)

Figure 7. Distribution of agricultural labourers on the basis of systolic blood pressure

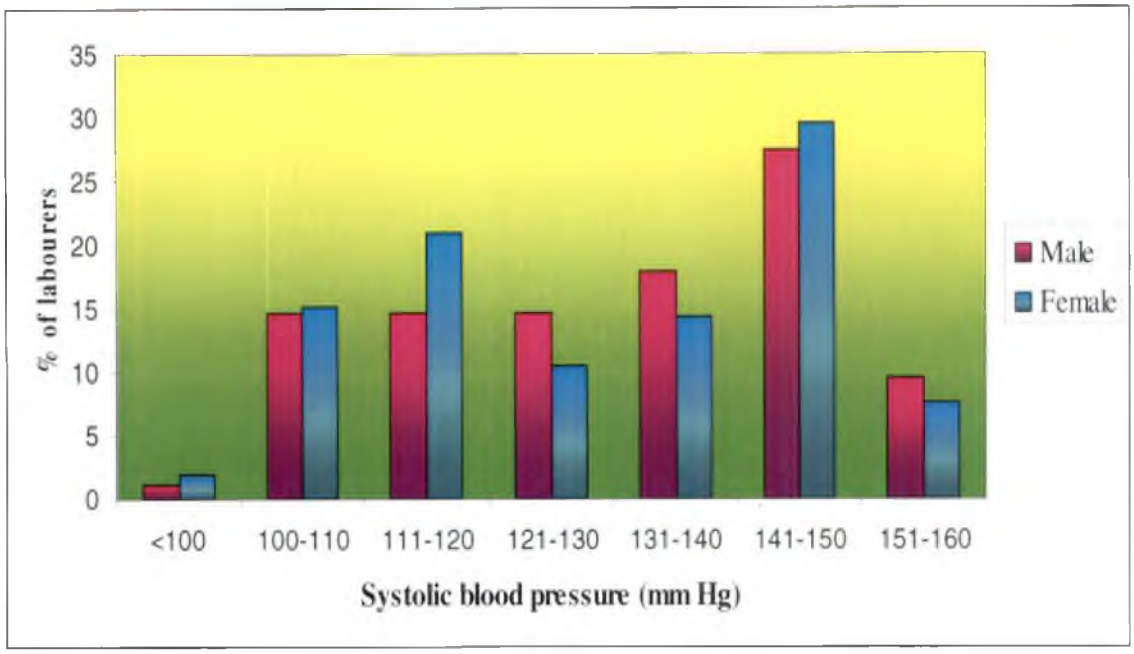
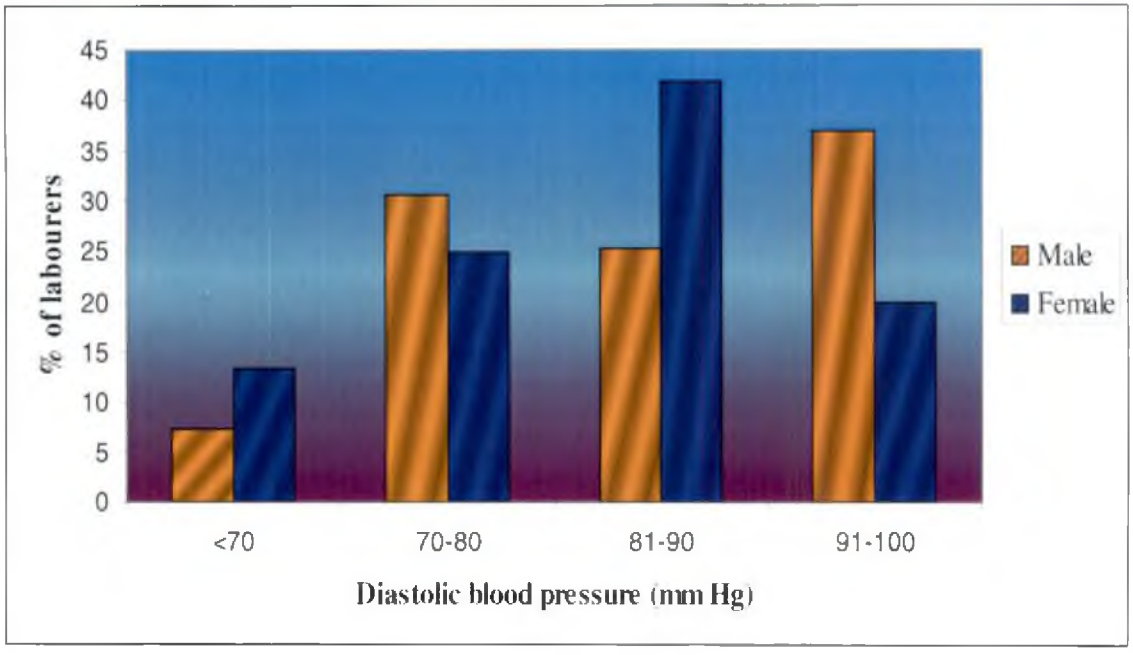


Figure 8. Distribution of agricultural labourers on the basis of diastolic blood pressure



4.5.2. Prevalence of hypertension among agricultural labourers

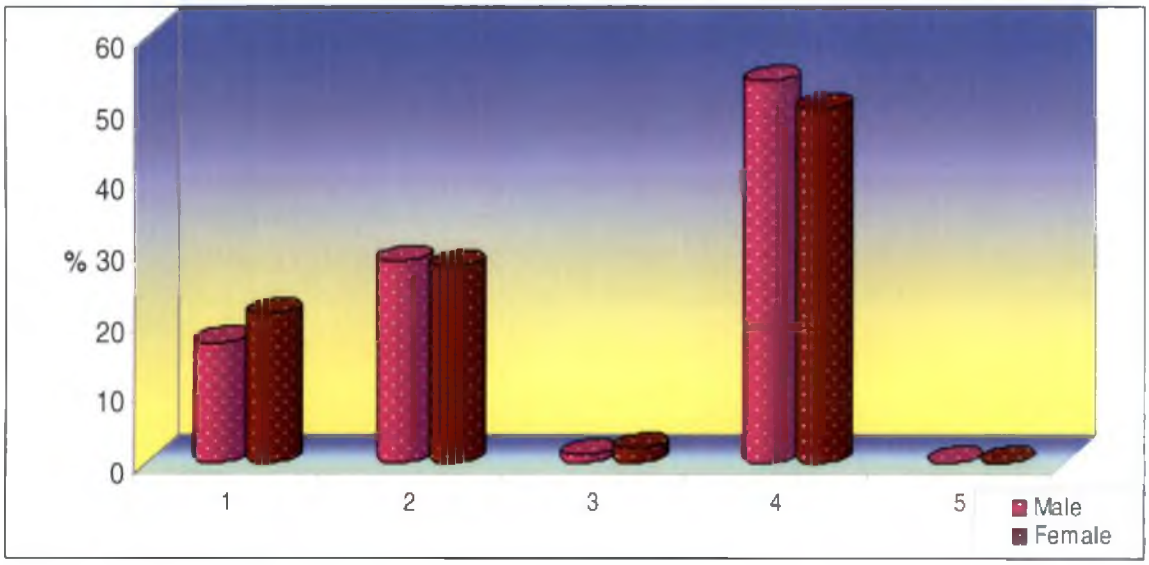
To find out the prevalence of hypertension among agricultural labourers the subjects were grouped on the basis of the classification of hypertension suggested by JNC VII criteria (Chobanian *et al.*, 2003). It was found that 53.68 per cent male and 49.8 per cent female agricultural labourers had systolic blood pressure in the range of 140 to 159 mm Hg and diastolic blood pressure 90 to 99 mm Hg indicating stage 1 hypertension. None of the subjects had hypertension stage 2. Only 28.42 per cent male and 27.62 per cent female labourers had normal systolic blood pressure of 120 mm Hg and diastolic blood pressure of 80 mm Hg. The details are given in Table 41 and Figure 9.

Table 41. Classification of agricultural labourers on the basis of blood pressure

Category	Male	Female
Below normal	16 (16.84)	22 (20.95)
Normal (120-80 mm Hg)	27 (28.42)	29 (27.62)
Pre- hypertension (120-139/80-90 mm Hg)	1 (1.05)	2 (1.9)
Hypertension- stage 1 (140-159/90-99 mm Hg)	51 (53.68)	52 (49.8)
Hypertension – stage 2 (≥160-≥100 mm Hg)	-	-
Total	95 (100)	105 (100)

(Figures in parenthesis are percentages)

Figure 9. Prevalence of hypertension among agricultural labourers



1- Below normal

2- Normal (120-80 mm Hg)

3- Pre-hypertension (120-139/80-90 mm Hg)

4- Hypertension- Stage 1 (140-159/90-99 mm Hg)

5- Hypertension- Stage 2 (≥160-≥100 mm Hg)

4.5.3. Distribution of respondents on the basis of systolic and diastolic blood pressure and prevalence of hypertension among respondents

The details on the systolic and diastolic blood pressure of respondents selected for the study in experimental group are furnished in Table 42.

Among the respondents in experimental group selected for the study 90 per cent of males and 98 percent of females had systolic blood pressure in the range of 140 to159 mm Hg and the rest had 121 to 139 mm Hg. Diastolic pressure of 70 per cent male 42 per cent female respondents were found to be in the range of 91 to 99 mm Hg. Thirty per cent male and 58 per cent female respondents had diastolic blood pressure in the range of 81 to 90 mmHg.

Table 42. Distribution of respondents on the basis of blood pressure in experimental group

Blood pressure	Male (n=50)	Female (n=50)
Systolic blood pressure (mm Hg)		
121-139	5 (10)	1 (2)
140-159	45 (90)	49 (98)
Diastolic blood pressure (mm Hg)		
81-90	15 (30)	29 (58)
91-99	35 (70)	21 (42)

(Figures in parenthesis are percentages)

The respondents in experimental group selected for the study were further categorized on the basis of JNC VII criteria suggested by Chobanian *et al.* (2003) for

blood pressure. It was found that 90 per cent male and 98 per cent female respondents had stage 1 hypertension with a systolic and diastolic blood pressure in the range of 140 to 159 and 90 to 99 mm Hg respectively. Details are given in Table 43.

Table 43. Classification of respondents of experimental group on the basis of blood pressure

Category	Male	Female
Pre- hypertension (120-139/80-90 mm Hg)	5 (10)	1 (2)
Hypertension- stage 1 (140-159/90-99 mm Hg)	45 (90)	49 (98)
Hypertension – stage 2 (≥160-≥100 mm Hg)	-	-
Total	50 (100)	50 (100)

(Figures in parenthesis are percentages)

4.5.4. Personality traits of respondents

Only 8 per cent of male and 18 per cent of female respondents in experimental group indicated that they had mental tensions due to their personal problems especially with respect to indebtedness. None of the respondents in control group indicated any mental tension. (Table 44)

4.5.5. Medical history of the family

The medical history of the family members indicated that in control and experimental groups they took medicines for various diseases like diabetes mellitus (28% and 37%), hypertension (6% and 14%) and CVD (8% and 2%). Regarding the type of medicine taken by the family members it was found that majority of the

members in control (95.45%) and experimental (81.03%) groups took allopathic medicines and the rest took homeopathic and ayurvedic medicines. (Table 45)

Table 44. Personality traits of respondents

Sl. No.	Personality traits	Number of respondents			
		Control		Experimental	
		Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
1	Mental tension				
	Present	-	-	4 (8)	9 (18)
	Absent	25 (100)	25 (100)	46 (92)	41 (82)

(Figures in parenthesis are percentages)

Table 45. Medical history of the family

Sl. No.	Details	Number of families	
		Control	Experimental
1	**Name of disease**		
	Diabetes	14 (28)	37
	Hypertension	3 (6)	14
	Cardio vascular diseases	4 (8)	2
	Other diseases	1 (2)	5
	No diseases	28 (56)	42
	Total	50 (100)	100
2	**Type of medicine taken**		
	Allopathic	21 (95.45)	47 (81.03)
	Homeopathic	1 (4.55)	7 (12.08)
	Naturopathy	-	-
	Ayurvedic	-	4 (6.89)

(Figures in parenthesis are percentages)

4.5.6. Family history of hypertension

From Table 46, it is clear that about 54 per cent and 75 per cent of family members in control and experimental groups were aware about the family history of hypertension. Among this, in experimental group it was seen that only 10.67 per cent of respondents were aware that they are having hypertension.

Table 46. Family history of hypertension

Sl.No.	Details	Number of families	
		Control	Experimental
1	Hypertension		
	Present	27 (54)	75 (75)
	Absent	23 (46)	25 (25)
	Total	50 (100)	100 (100)
2	Family member		
	Myself	-	8 (10.67)
	Mother	11 (40.75)	23 (30.67)
	Father	8 (29.63)	20 (26.67)
	Husband	3 (11.11)	8 (10.67)
	Wife	3 (11.11)	10 (13.33)
	Children	-	1 (1.33)
	Brother	1 (3.70)	3 (4.00)
	Sister	1 (3.70)	2 (2.66)
	Total	27 (100)	75 (100)

(Figures in parenthesis are percentages)

4.5.7. Blood pressure measurement

It was observed that about 32 per cent and 40 per cent of male and female respondents in control group used to take blood pressure measurement once in a month, while in experimental group it was 6 per cent and 18 per cent respectively. About 12 per

cent and 16 per cent of male and female respondents in control group used to take blood pressure measurement occasionally while in experimental group it was 22 per cent and 30 per cent respectively. Details are given in Table 47.

Table 47. Details on measuring blood pressure

Frequency	Number of respondents			
	Control		Experimental	
	Male (n=25)	Female (n=25)	Male (n=50)	Female (n=50)
Weekly	2 (8)	3 (12)	4 (8)	7 (14)
Monthly	8 (32)	10 (40)	3 (6)	9 (18)
Occasionally	3 (12)	4 (16)	11 (22)	15 (30)
Never	12 (48)	8 (32)	32 (64)	19 (38)

(Figures in parenthesis are percentages)

4.5.8. Risk factors for hypertension

To assess the contributory risk factors for hypertension the data collected was cross tabulated with blood pressure. Socio economic variables like age, income, type of family, educational status of respondents and family size; dietary factors like food habits, use of oil, use of pickle, pappad and fried food items; personal habits like smoking, tobacco chewing, alcohol consumption and regular physical exercise as well as other factors such as personality traits, family history of hypertension, BMI and waist hip ratio were selected for statistical analysis so as to identify the risk factors for hypertension among agricultural labourers. These variables were statistically analysed with respect to Odds ratio and Spearman's Correlation coefficient. The results are furnished in Table 48.

Table 48. Impact of different factors on hypertension

Sl. No.	Factors	Odds ratio		Correlation coefficient	
		Male	Female	Male	Female
1	**Socio economic factors**				
	Age	0.950	1.047	0.031	0.195*
	Income	1.0	1.0	0.192*	-0.03
	Type of family	106.128	1.116	-0.076	0
	Educational status	0.651	0.418	-0.245**	-0.391**
	Family size	7.289	1.165	0.407***	-0.020
2	**Dietary factors**				
	Food habit	0.056	1.221	-0.174	0.027
	Type of oil	0.079	0	-0.084	-0.429***
	Use of pickle	8.253	0.912	-0.032	-0.042
	Use of pappad	109.616	1.928	0.707***	0.169
	Use of fried food items	56.94	0.389	0.648***	-0.177
3	**Personal habits**				
	Smoking	5.264	-	0.441***	-
	Tobacco chewing	2.098	13.453	0.512**	0.260***
	Alcohol consumption	1.409	-	0.097	-
	Regular physical exercise	0.766	0.092	0.283	0.018
4	**Other factors**				
	Personality traits	1.2E+09	5.7E+08	0.168	0.277**
	Family history of hypertension	1.313	0.651	0.134	-0.038
	Body mass index	1.278	0.671	0.263*	-0.146
	Waist hip ratio	0	4.5E+12	-0.022	0.507***

* - Significant at 10% level
** - Significant at 5% level
*** - Significant at 1% level

From the Table it is clear that among the socio economic variables, type of family and family size had direct influence on hypertension among male respondents. Significant positive correlation was observed between factors like income and family size with hypertension among male respondents and with age among female respondents. Significant negative correlation was observed between educational status and hypertension among male and female respondents.

Use of pickle, pappad and fried food items were the dietary factors which have strong impact on hypertension among male respondents. The correlation observed between these two factors and hypertension was found to be statistically significant at 1 per cent level. Among female respondents use of pappad and fried food items were found to have significant influence on hypertension. In the case of females statistically significant negative correlation was noticed between the type of oil used and hypertension.

The personal habits like smoking, tobacco chewing, alcohol consumption and lack of exercise were the factors which were having direct influence on hypertension in male respondents and among these factors, smoking and tobacco chewing were found to be having significant relationship with hypertension. Among female respondents tobacco chewing and lack of exercise had direct influence on hypertension out of which only tobacco chewing had significant positive correlation.

When the impact of personality traits, family history of hypertension as well as BMI and waist hip ratio with hypertension was assessed it was seen that among male respondents except waist hip ratio all the other factors had direct influence on hypertension. Among these factors only BMI was found to be having significant positive correlation with hypertension. Among female respondents personality traits as well as waist hip ratio were the factors which had direct impact on hypertension which were also found to be having statistically significant correlation.

Discussion

5. DISCUSSION

Critical and brief discussion of the major findings of the study is presented in this chapter. The discussion is categorised into the following broad sections.

1. Socio economic status of agricultural labourer households
2. Personal habits and working pattern of agricultural labourers
3. Food consumption pattern of agricultural labourers
4. Nutritional status of agricultural labourers
5. Prevalence and risk factors for hypertension among agricultural labourers

5.1. SOCIO ECONOMIC STATUS OF AGRICULTURAL LABOURER HOUSEHOLDS

In the present study, most of the households belonged to the Hindu community and among them majority of the families in control (62%) and experimental (61%) groups belonged to forward caste.

Due to urbanization and changes in social values, joint family system is disintegrating in different communities of Kerala. In the present study also nuclear family system was found among majority of the agricultural labourer families in both groups. Saxena (1986) indicated that nuclear families are better than joint families in health and development. Various studies conducted also observed nuclear family system in the agricultural labourer households of Kerala (Seshadrinath 1993; Shyna 1996; Smitha 1999; Jyothi 2003 and Lawrence 2003).

Family size is a major factor influencing the nutritional status of the family members. Due to the availability of medical and educational facilities small family norm has become very popular even among the low income groups. In the present study

nearly 42 per cent of families in control group and 23 per cent in experimental group had only upto three members. Fifty per cent of families in control and 68 per cent in experimental group were found to be medium sized with 4-6 members. Medium sized families were also observed by Jayanthakumari (1993), Smitha (1999) and Lawrence (2003) in the families of agricultural labourers. However, Usha *et al.* (1990) observed upto nine members in the households of farm women in Thiruvananthapuram district of Kerala.

Literacy is an important demographic characteristic which is an indicator of the level of advancement of people. The present study revealed that majority of the family members and respondents in control and experimental groups were literates. In India, even though literacy level is very high, men have better education than women probably because of the social discrimination against women (Ingle and Khari, 1987 and Joseph, 1991). Contrary to this observation, in the present study, female respondents were found to be more educated than male counterparts. Similar findings were reported by Anil *et al.* (2001) among dairy farmers of Kerala. Jyothi (2003) also reported similar findings among agricultural labourers in Palakkad district of Kerala. However, the studies conducted by Choudhary (1990) and Smitha (1999) indicated higher literacy among male members of agricultural labourer households.

Occupational status of family members indicated that majority of the female members in both control and experimental groups had no occupation and male members were working as agricultural labourers or involved in private jobs or buisiness. Smitha (1999) and Jyothi (2003) also observed more percentage of occupation among male members of agricultural labourer households.

Family income is one of the important factors contributing to the economic status of the family. In the present study, it was seen that 66 per cent of the families in control and 72 per cent in experimental groups had a monthly income in the range of

Rs. 4000 to 10,000. In contrast to this, Shyna (1996), Smitha (1999), Jyothi (2003) and Lawrence (2003) observed a monthly income of less than Rs. 4000 among majority of the agricultural labourer families.

Land is considered as one of the chief determinants of resource position. The present study indicated that 80 per cent of the families in control group and 38 per cent in experimental group owned 5 to 10 cents of land. Cherian (1992), Seshadrinath (1993), Smitha (1999), Jyothi (2003) and Lawrence (2003) also observed small land holdings among agricultural labourer families.

Though, all the households had land as their own, only 16 per cent and 30 per cent of families in control and experimental groups cultivated different crops like coconut, cashew, pepper and paddy in their land. Majority of families did not cultivate any crops. Smitha (1999), Jyothi (2003) and Lawrence (2003) also observed that majority of agricultural labourer families though possessed land as their own did not cultivate any crops.

Immink *et al.* (1981) opined that possession of cattle, poultry, kitchen garden and use of home produce are positively linked with the nutritional status of the family. In the present study, it was observed that only 8 per cent (control) and 14 per cent (experimental) of the families possessed livestock. Similar reports with respect to domestication of animals were reported by Smitha (1999), Jyothi (2003) and Lawrence (2003) among agricultural labourer families. How ever, in a study conducted among farm families by Udaya (1996) indicated that about 78 per cent of families possessed domestic animals.

Indebtedness of family members indicated that 92 per cent (control) and 76 per cent (experimental) had taken loan from different sources for the purpose of marriage,

house construction and to clear the debt. Smitha (1999), Jyothi (2003) and Lawrence (2003) also indicated indebtedness among majority of the agricultural labourer families.

Monthly expenditure pattern of the families indicated that about 82 per cent of families in the control group spent between 20 to 50 per cent of their income for food where as in experimental group, 43 per cent of the families spent between 30 to 50 per cent of their income for food. Similar findings were reported by Usha *et al.* (1990) and Udaya (1996) among farm families and Smitha (1999) and Jyothi (2003) among agricultural labourer families. In contrast, Prema (1996) observed that the farm families spent 65 to 75 per cent of their monthly income for food. Study conducted by Devadas and Easwaran (1997) also indicated that the rural households in Tamilnadu spent up to 90 per cent of their monthly income for food.

The present study indicated that majority of the families in both groups spent less than 10 per cent of their income on clothing, shelter, transport, recreation, electricity, health and luxury. Similar findings were reported by Usha *et al.* (1990) and Udaya (1996) among farm families and Jyothi (2003) and Lawrence (2003) among agricultural labourer households.

Majority of the families in control (60%) and experimental (78%) groups did not have the habit of saving money for future purpose. This is in line with the findings of Jyothi (2003) and Lawrence (2003). However, studies conducted by Cherian (1992), Shyna (1996) and Smitha (1999) among the farm families and agricultural labourer households reported that majority of the families saved money to meet their future necessities.

The housing conditions of the families in the two groups indicated that majority of families lived in their own houses which are single storied with 2-3 rooms and brick as the wall material and tiles as the roofing material. All the houses had separate kitchen

facilities. Similar housing conditions among agricultural labourer families were observed by Smitha (1999), Jyothi (2003) and Lawrence (2003).

The main source of drinking water for majority of the households in both groups was from their own well and public tap. Usha *et al.* (1990), Jyothi (2003) and Lawrence (2003) also reported similar findings.

Though the lavatory facilities in both groups was found to be satisfactory, majority of the households in control (88%) and experimental (83%) groups did not have proper drainage facilities. Smitha (1999) and Lawrence (2003) also observed good lavatory facilities and improper drainage facilities among agricultural labourer households. However, Jyothi (2003) in a study conducted among women labourers involved in rice cultivation observed improper lavatory as well as drainage facilities in their households.

In Kerala electrification has occurred even in remote villages. In the present study also it was found that majority of the families in both groups had electricity facilities. This finding is in concurrence with the observations of Shyna (1996), Mathen (1998), Smitha (1999), Jyothi (2003) and Lawrence (2003) among labour families.

Recreational facilities were present in all households in both groups. Udaya (1996), Shyna (1996), Smitha (1999), Jyothi (2003) and Lawrence (2003) also observed the same result. However, the findings of Jose (1998) were found to be contradictory to the present finding in which the author observed fewer recreational facilities among the casual labourer households.

Majority of the families (68%) surveyed used wood as the major source of fuel. Similar findings were observed by Smitha (1999), Jyothi (2003) and Lawrence (2003) in their studies among the households of agricultural labourers.

Regarding the health care services, it was observed that 57.5 per cent of the families dependent mainly on the primary health center and 21.5 per cent depended on private hospitals. Similar results were reported by Shyna (1996), Smitha (1999), Jyothi (2003) and Lawrence (2003) in their studies. Most of the families took allopathic medicine for treating different diseases.

5.2. PERSONAL HABITS AND WORKING PATTERN OF AGRICULTURAL LABOURERS

Regarding the personal habits of male and female respondents of hypertensive and non hypertensive groups it was seen that smoking, tobacco chewing and alcohol consumption was prevalent more among the respondents who are having hypertension. Smoking and alcohol consumption was found only among the male respondents. Smoking and alcohol consumption are considered as the important risk factors for hypertension by McMohan (1987), Keil *et al.* (1993), WHO (1993), Paul (1999), Fucks *et al.* (2001), Xin *et al.* (2001), Darwin and Carma (2002)

Though, most of the respondents in the present study are not in the habit of taking regular exercise, 32 per cent of respondents (control) took regular physical exercise like walking and cycling daily while in experimental group only 18 per cent took regular physical exercise. Whelton *et al.* (2002), Krousel *et al.* (2004) indicated the advantage of taking regular exercise to control hypertension.

Time expenditure pattern and working pattern of the respondents indicated that majority of the respondents in both groups worked for 6-7 hours daily and spent 6-7 hours for household activities. Nearly 86 per cent (control) and 76 per cent (experimental) worked for 6 days in a week with 25 to 26 days mandatory working days

Smitha (1999) indicated that the agricultural labourers used to work in the field for 8-10 hours in a day.

5.3. FOOD CONSUMPTION PATERN OF AGRICULTURAL LABOURERS

Precise information on the food consumption pattern of people is essential not only for assessing the nutritional status of the community but also for elucidating the food needs of population groups at national and regional levels (Thimmayamma and Rau, 1996).

The present study revealed that 84 to 96 per cent of the respondents were non-vegetarians. Vegetarian food habit was observed only among few families. Smitha (1999), Jyothi (2003) and Lawrence (2003) also observed non vegetarian food habit among agricultural labourers.

The economic status of the families and local availability of food items are the two important factors which influence frequency of use of various foods. Cereals, other vegetables, milk and milk products, fats and oils, sugar, spices and condiments and fish were the most frequently used food items in both groups. Similar results were reported by Smitha (1999), Jyothi (2003) and Lawrence (2003).

Advance meal planning helps in better organization and faster completion of household chores. Majority of the families in both groups planned their meals in advance and the planning was based on the availability of foods.

Lawrence (2003) among farm families and agricultural labourer families. In contrast to this Jose (1998) indicated that majority of the casual labourers consumed more than three meals daily.

Dietary pattern is reported to be an important contributory factor for hypertension. Increased intake of salt, processed foods like pickles and pappads, frequent use of dried fish, fried food items and the oil which contains saturated fatty acids are considered as the important diet related factors leading to hypertension. The details on the use of specific food items by the respondents indicated that about 98 per cent of male and female respondents in experimental group used coconut oil as the medium of cooking. While in control group only 80 to 88 per cent used coconut oil for cooking purpose. Most of the respondents in hypertensive group were in the habit of using pickles (86 to 90%), dried fish (74 to 78%), pappad (82 to 86%) when compared to 36 to 48 per cent, 16 to 28 per cent and 40 to 56 per cent respectively in non hypertensive group. More number of respondents in hypertensive group (30 to 36%) also consumed fried food items daily when compared to 24 to 32 per cent respondents who are having normal blood pressure. Anderson *et al.* (2005) indicated that modest lifestyles and dietary changes could help to treat and often delay or prevent hypertension. Konjuri and Rahimi (2007) also reported 'no added salt diet' as the best known diet for hypertension. Sodium restriction to control hypertension was suggested by Cutler *et al.* (1997) and Sacks *et al.* (2001)

5.4. NUTRITIONAL STATUS OF THE RESPONDENTS

To assess the nutritional status of agricultural labourers BMI, waist hip ratio and actual food and nutrient intake were computed.

Body mass index (BMI) is an important indicator of current nutritional status. The BMI of the respondents revealed that 38 per cent of male respondents in hypertensive group had Grade 1 obesity when compared to only 16 per cent in non hypertensive group. However, the percentage of women respondents with Grade 1 obesity was found to be lower in hypertensive group (16%) when compared to non hypertensive group (32%). Nearly 22 per cent of respondents with hypertension were also found to be at risk for obesity when compared to 16 per cent respondents in non hypertensive group. Obesity has been considered as one of the most important risk factors for hypertension by Heyka (1999), Garrison *et al.* (2001), Vasan *et al.* (2001) and Bray (2003). Gupta (1997) also indicated significant correlation between hypertension and body mass index. Tunstall *et al.* (1997), Kaplan (1998) and Ebrahim and Smith (1998) also indicated weight reduction as an important approach to decrease hypertension.

With respect to the nutritional status 48 to 60 per cent of respondents in non hypertensive group were found to be having normal BMI in the range of 18.5 to 22.9 when compared to 30 to 64 per cent of respondents in non hypertensive group. Udaya (1996), Smitha (1999) and Lawrence (2003) also reported normal BMI among 38.33 to 50.67 per cent of farm women and women agricultural labourers.

Waist hip ratio is a sensitive indicator to assess the risk of developing various degenerative diseases. Gafoorinissa and Krishnaswamy (2000) indicated that fat around the abdomen (android) is more dangerous than fat around the hips (gynoid) and suggested to meet the waist line trim and to maintain a waist to hip ratio less than 1 among men and less than 0.8 among women. In the present study 84 per cent of female respondents with hypertension had a waist hip ratio more than 0.85 when compared to 64 per cent respondents in non hypertensive group. However, among male respondents of hypertensive group waist hip ratio above 0.95 was observed only among 2 per cent respondents. Android obesity is quite often associated with hypertension,

hypertriglycerdemia, hyper insulinemia and diabetes. Sivakumar (2000) also indicated that waist hip ratio more than 0.85 in women is associated with high risk. Rajyalakshmi (2000) also indicated increased risk of cardiovascular diseases and hypertension among males and females with upper body obesity.

The results of one- day food weighment survey indicated that the mean intake of all food items was lower than the recommended allowances among both hypertensive and non hypertensive groups. In accordance to this result Seshadrinath (1993) reported deficient intake of all food groups among male and female agricultural labourers. Lawrence (2003) indicated a deficient intake of cereals, pulses, roots and tubers and fats and oils among agricultural labourers of organized and unorganized sectors.

The nutritional quality of the diet also indicated lower intake of all nutrients among men and women of both hypertensive and non hypertensive groups. Jyothi (2003) also indicated deficient intake of all nutrients among women laboueres involved in rice cultivation.

5.5. PREVALENCE AND RISK FACTORS FOR HYPERTENSION AMONG AGRICUTURAL LABOURERS

The systolic and diastolic blood pressure of male agricultural labourers initially selected for the study varied from 99 to 154 mm Hg and 62 to 98 mm Hg. In the case of females systolic blood pressure varied from 98 to 155 mm Hg and diastolic blood pressure 63 to 98 mm Hg. When the agricultural labourers were grouped on the basis of the classification suggested by JNC VII criteria by Chobanian *et al.* (2003) to find out the prevalence of hypertension, it was seen that 53.68 per cent of male 49.8 per cent female agricultural labourers had stage 1 hypertension. Hypertension stage 2 was not observed among any of the respondents.

Only 28 per cent respondents had blood pressure in the normal range of 120-80 mm Hg.

Among the respondents with hypertension (experimental) selected for the study 90 per cent of male and 98 per cent female respondents had hypertension stage 1. Kutty *et al.* (2002) and Zachariah *et al.* (2003) also indicated 55 per cent prevalence of hypertension in Kerala. A very high prevalence of hypertension (61%) among men and women aged above 30 years was observed by Hazarika *et al.* (2002). Similar observations of the prevalence of hypertension was indicated by Hypertension Study Group (2001) among the elderly populations of urban (69%) and rural (55%) Kerala.

When the impact of socioeconomic factors like age, income, type of family, educational status and their family size on hypertension was studied it was seen that family type and family size had a strong influence on hypertension. In the present study, it was seen that 92 to 96 per cent of respondents selected followed nuclear family system and 48 to 76 per cent of respondents had 4 to 6 members in their family. Joint family system which was prevalent in Kerala has disintegrated and its place has been taken by nuclear type families. In the joint family system the constraints of income, work and other duties will be shared by other family members and thus the burden of heavy work load and the stress imposed will be decreased. So in nuclear type families the stress imposed among the respondents might be the cause for hypertension.

Use of pickle, pappad and fried food items were found to be the dietary factors leading to hypertension. Various studies conducted also revealed the excess use of these food items and salt as the risk factors for hypertension. In the present study, it was seen that more than 80 per cent of respondents in hypertensive group used pickles and pappads daily where as in non hypertensive group only 36 to 56 per cent consumed these two food items daily. None of the respondents restricted salt also. Consumption of salt rich foods is considered to be one of the major factors leading to hypertension and

thus to cardio vascular damages. McCarron (1991), Dustan *et al.* (1994), Cutler *et al.* (1997), Appel *et al.* (1997), and Sacks *et al.* (2001) also reported salt rich foods as an important risk factor for hypertension.

Different personal habits like smoking, tobacco chewing, lack of regular physical exercise as well as consumption of alcohol were also found to have direct influence on hypertension. In the present study, nearly 46 to 64 per cent of male respondents of hypertensive group had the habit of smoking, tobacco chewing as well as alcohol consumption when compared to 24 to 40 per cent in control group. In the case of female respondents also 50 per cent of the respondents with hypertension had the habit of tobacco chewing when compared to only 12 per cent in control group. Smoking, tobacco chewing as well as alcohol consumption as risk factors for hypertension had been reported by Keil *et al.* (1993), Gupta and Gupta (1994), Beegum and Singh (1995), Gupta *et al.* (1995), Singh (1995), Gupta (1997), Paul (1999), Fucks *et al.* (2001), Xin *et al.* (2001), Darwin and Carma (2002) and Krousel *et al.* (2004). Mohan (1996) indicated sedentary habits as one of the factors responsible for higher prevalence of hypertension.

Among the male respondents personality traits, family history of hypertension and BMI were found to be the risk factors for hypertension while in females personality traits and waist hip ratio were found to have strong impact for hypertension. Personality traits leading to stress might be the factor responsible for hypertension.

The BMI of male respondents in experimental group indicated that nearly 38 per cent had Grade 1 obesity and 28 per cent were found to be at risk for obesity when compared to 16 per cent each in control group. Obesity has been reported as one of the most important risk factors for hypertension by Heyka (1999), Garrison *et al.* (2001) and Vasan *et al.* (2001). Significant correlation between BMI and hypertension was reported by Gupta (1997). Among the female respondents in experimental group 84 per

cent had a waist hip ratio above 0.85. Gafoorinissa and Krishnaswamy (2000) suggested to keep the waist line trim and to maintain a waist to hip ratio less than 1 among men and 0.8 among women. Sivakumar (2000) also indicated a waist hip ratio above 0.85 in women as an important risk factor for cardio vascular diseases. Increased risk of CVD and hypertension among women with upper body obesity was also reported by Rajyalakshmi (2000).

Thus, type of family, family size, use of pickle, pappad, fried food items, smoking, tobacco chewing, alcohol consumption, lack of regular physical exercise, personality traits, family history of hypertension, body mass index and waist hip ratio were identified as the risk factors for hypertension among agricultural labourers..

Summary

6. SUMMARY

The present study entitled "Prevalence of hypertension and assessment of risk factors among agricultural labourers" was conducted among the agricultural labourers of Kerala Agricultural University, Vellanikkara, Thrissur District. An initial assessment of blood pressure of 200 labourers in the age group of 35 to 60 years working in the different farms of KAU was taken. These agricultural labourers were further classified according to sex and also on the basis of their blood pressure as non hypertensive and hypertensive groups. From this, 50 male 50 female labourers who are hypertensive and 25 male and 25 female labourers who are non hypertensive were selected for the study as experimental and control groups respectively.

Socioeconomic status of the selected families, personal habits, working pattern, food consumption pattern and nutritional status of the respondents were studied to find out the risk factors for hypertension among agricultural labourers.

Information regarding socio economic condition of the families indicated that most of the families in control and experimental groups were Hindus and belonged to forward caste. Nuclear family system was followed by 92 to 96 per cent of the selected families and 48 to 76 per cent of the families had 4 to 6 members.

Composition of the families showed that 46.88 per cent and 43.65 per cent of male members and 41.77 per cent and 46.71 per cent of female members in control and experimental groups respectively were in the age group of 21 to 50 years. Majority of the family members and respondents in control and experimental groups were literates.

Occupational status of family members revealed that they involved in private jobs, business and were engaged as agricultural labourers.

Monthly income of 21 to 38 per cent of the families varied from Rs. 4001 to 6000 and 4 and 18 per cent of families in control and experimental groups earned an income in between Rs. 8001 to 10,000 per month.

Eighty per cent of the families in control group and 38 per cent in experimental group owned 5 to 10 cents of land as their own and 16 to 30 per cent of families cultivated crops like coconut, cashew, pepper and paddy. Majority of the families did not possess any domestic animals.

Expenditure pattern of the families indicated that 82 per cent and 43per cent in control and experimental groups respectively spent 20 to 50 per cent of their income for food.

Majority of the families in both groups did not have the habit of saving money for future purpose. Most of the respondents in both groups borrowed money from different sources for the purpose of marriage, house construction and to clear the debt.

Majority of the families in both groups had their own houses with brick as the wall material and tiles as the roofing material with two to three rooms. All the families in both groups had separate kitchen and proper lavatory facilities. The drainage facilities of the houses in both groups were found to be inadequate. The recreational and electrical facilities of the families were found to be adequate. Most of the families used water from well and public tap for drinking purposes.

About 58 per cent of the families used the facilities available in Primary Health Center for health care.

Personal habits of the respondents revealed that, 24 per cent of the male respondents in control and 64 per cent in experimental group had the habit of smoking.

About 12 to 24 per cent respondents in control group and 46 to 50 per cent of respondents in experimental group had the habit of tobacco chewing. Alcohol consumption was found only among 40 per cent of male respondents in control and 56 per cent in experimental groups. Majority of respondents in both groups did not have the habit of taking regular physical exercise.

Time expenditure of the respondents revealed that majority in both groups worked for 6 to 7 hours daily. Time spent for house hold activities and sleep among most of the respondents in both groups varied from 6 to 7 hours.

Regarding working pattern, all respondents in both control and experimental groups got work for 5 to 6 days in a week with three hours interval and 6 to 7 hours of work per day.

Food consumption pattern of the respondents indicated that they consumed rice as their staple food and majority followed non vegetarian food habit.

Cereals, pulses, other vegetables, fats and oils, spices and condiments, salt, sugar, milk and milk products and fish were consumed most frequently by the respondents in control group while in experimental group all the above food items except pulses were found to be the most frequently used food items.

Advance meal planning was popular in both groups with three major meals a day pattern.

Majority of the respondents in experimental group used coconut oil for cooking and used pickle, pappad, dried fish and fried food items daily.

None of the respondents in both groups restricted food to control hypertension and included any specific food item in daily diet to control hypertension.

The nutritional status of the respondents was assessed through anthropometric measurements and one day food weighment method.

Anthropometric measurements revealed that the weight of male respondents in control group varied from 46-70 kg and in females the weight varied from 45-71 kg. In experimental group the weight of male and female respondents varied from 49-71 kg and 45 to 70 kg.

The height of the respondents in control group varied from 145-165 cm among males and in females the height varied from 145-165 cm. In experimental group the height of male and female respondents varied from 145 to 165 cm and 145 to 166 cm respectively.

Body mass index showed that about 60 per cent male and 48 per cent female respondents in control group and 30 per cent male and 64 per cent female respondents in experimental group had normal BMI in the range of 18.5 to 22.9. About 16 per cent (male) and 32 per cent (female) respondents of control group and 38 per cent (male) and 16 per cent (female) respondents in experimental group had Grade 1 obesity.

Waist hip circumference of the respondents revealed that majority had waist circumference in the range of 71-90 cm and hip circumference in the range of 81-100 cm. Waist hip ratio of the respondents revealed that majority of male respondents in control and experimental groups had waist hip ratio less than 0.95 and in case of females majority had the ratio above 0.85 both in control and experimental groups.

One day food weighment survey indicated that the mean intake of all food items was lower than the recommended allowances in both male and female respondents of control and experimental groups. The nutritional quality of diet revealed lower intake of all essential nutrients in both male and female respondents of control and experimental groups.

About 53.68 per cent male and 49.8 per cent female agricultural labourers had stage 1 hypertension. Among the respondents with hypertension selected for the study 90 to 98 per cent of respondents had stage 1 hypertension.

Medical history of the family revealed that most of family members in both groups took allopathic medicines for different diseases. Nearly 54 per cent of respondents in control and 75 per cent in experimental groups indicated family history of hypertension. Blood pressure measurement was taken by only 32 to 40 per cent of respondents in control and 6 to 18 per cent of respondents in experimental groups once in a month.

Type of family, family size, use of pickle, pappad, fried food items, smoking, tobacco chewing, alcohol consumption, lack of regular physical exercise, personality traits, family history of hypertension, body mass index and waist hip ratio were identified as the risk factors for hypertension among agricultural labourers.

Future line of work:

The study may be conducted among different categories of labourers to find out the prevalence and risk factors for hypertension.

References

REFERENCES

Abraham, R.A. and Jagannathan, D. 1999. Impact of diet counseling on selected obese cardiovascular patients. *The Indian J. Nutr. Dietet.* 26: 249-251.

Aebi, H.E. 1983. *Biochemical parameters as indicators for the nutritional status.* Fourth Asian Congress of Nutrition. Programme and Abstracts. Technical Monograph No.6. Willey Interscience Publication, New York, 70p.

Alexander, C.N., Schniedr, R.H. and Staggers, F. 1996. Trail of stress reduction for hypertension in older African Americans. Sex and risk sub group analysis. *Hypertension* 28: 228-237.

Anand, M.R. 2001. *Epidemiology of hypertension.* Academic Press IJCP Publishers, New Delhi, 250p.

Anderson, J.W. 1993. Plant fibre and blood pressure. *Ann. Int. Med.* 98: 842-846.

Anderson, W.P., Kett, M.M., Stevenson, K.M., Edgely, A.J. and Denton, K.M. 1997. Reno vascular hypertension. *Hypertension* 36:648.

Anderson, J.L., Young, L. and Long, E. 2005. *Diet and hypertension. J. Clin. Hypertension* 4(7): 189-196.

Anil, S.S., Geevargheese, P.I. and Anil, L. 2001. Socio personal and socio economic profile of dairy farmers in Kerala (abstract). In: *Abstracts, National Conference on Strategies for Safe Food Production*; 22, November, 2001, Association of Food Scientists and Technologies, Thrissur. p. 30.

Appel, L.J., Miller, E.R. and Seidler, A.J. 1993. Does supplementation of diet with 'fish oil' reduce blood pressure: a meta analysis of controlled clinical trails. *Arch. Int. Med.* 153: 1429-1438.

Augustine, J. 1993. Factors influencing the working efficiency of women engaged in stone breaking with special reference to nutritional status. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 121p.

Bass, M.A., Wakefield, L. and Kolara, K. 1979. *Community, Nutrition and Individual Food Behaviour*. Burgers Publishing Company, Minesota, 153p.

Batliwala, S. 1998. Field of rice: health hazards of women and inborn children. *Manushi* 48: 28-29.

Beegum, R. and Singh, R.B. 1995. Prevalence of coronary heart disease and its risk factors in the urban population of South and North India. *Acta. Cariol.* 50: 227-240.

Beevers, G., Gregory, Y.H. and Brien, E. 2001. Blood pressure measurement-conventional sphygmomanometry: technique of blood pressure measurement. *BMJ.* 322: 1043-1047.

Bharucha, N.E. and Kuruvilla, T. 2003. Hypertension in the Parsi community of Bombay: a study on prevalence, awareness and compilance to treatment. *BMC Public Health* 3(1): 7-9.

Bose, D.S., Gwatkin, D., Guillet, M. and Heuvelin, P. 2007. The burden of disease among the global poor. *Lancet* 354: 586-589.

Brahmam, G.N.V. 1999. How nutritionally sound are our elderly. *Nutrition* 33: 13-21.

Bray, G.A. 2003. Risk of obesity. *Endocrinol. Metab. Clin. N. Am.* 32: 787-804.

Bucher, H.C., Cook, R.J. and Gyatt, G.H. 1996. Effects of dietary calcium supplementation on blood pressure: a meta analysis of randomized controlled trails. *JAMA*. 275: 1016-1022.

Bunker, J.A., Rutledge, T. and Hogan, B.E. 2004. Poor hypertension control: let's stop blaming the patients. *Cleve Clin. J. Med.* 69(10): 793-799.

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

Chadha, S.L., Radhakrishnan, S., Ramachandran, R. and Kaul, U. 1990. Epidemiological study of coronary heart diseases in urban population of Delhi. *J. Med. Res.* 92:424-430.

Cherian, L. 1992. Food consumption and energy expenditure pattern of agricultural labourers of Thiruvanathapuram district. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 133p.

Cherry, D.K. and Woodwill, D.A. 2002. National ambulatory medical care survey: 2000 summary. *Adv. Data* 328: 1-32.

Chobanian, A.V., Bakris, G.I., Black, H.R., Cushman, W.C., Green, L.A. and Izzo, J.L. 2003. Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of high blood pressure. *Hypertension* 42: 1206-1252.

Choudhary, B.N. 1990. Strategies for development of farm women- their roles and status. In: *Workshop on women in Agriculture*; October 29th – November

1st, 1990; National Institute of Rural Development, Hyderabad, *Background papers*, pp. 1-21.

Cutler, J.A., Follman, D. and Allender, P.S. 1997. Randomised trails of sodium reduction: an overview. *Am. J. Clin.* 20: 249-263.

Darwin, L. and Carma, A. 2002. Hypertension prevention and control. *Cardiol. Clin.* 20: 250-263.

Das, S.K., Sanyal, K. and Basu, A. 2005. Study of urban community survey in India: growing trend of high prevalence of hypertension in a developing country. *Int. J. Med. Sci.* 2: 70-78.

Devadas, R.P. and Easwaran, P. 1997. Intra- family food intake of selected rural households and food consumption pattern of pregnant women. *The Indian J. Nutr. Dietet.* 23 (12): 343.

Dewan, A. and Rowlands, R. 1986. Effect of cigarette smoking on serum cholesterol and blood pressure. *The Indian J. Nutr. Dietet.* 23:294-298.

Dole, P.V., Dahi, L.K., Eer, H.A. and Krebs, M.E. 1950. Dietary treatment of hypertension: clinical and metabolic studies of patients on rice- fruit diet. *J. Clinc. Invest.* 29: 1189-1206.

Dubey, V.D. 1954. A study on blood pressure amongst industrial workers of Kanpur. *J. Indiana. State. Med. Assoc.* 23(11): 495-498.

Dustan, H.P., Tarazi, R.C. and Bravo, E.L. 1994. Diuretic and diet treatment of hypertension. *Arch. Int. Med.* 133: 1007-1013.

Ebrahim, S. and Smith, G.D. 1998. Lowering blood pressure: a systematic review of sustained effects of non- pharmacological interventions. *J. Public Health Med.* 20: 441-448.

Erhun, W.O., Olayiwola, G., Agbani, E.O. and Osmotoso, N.S. 2005. Prevalence of hypertension in a university community in South West Nigeria. *African J. Bio. Med. Research* 8(1):15-19.

Fauvel, J.P., Quelin, P., Ducher, M., Rakotomalala, H. and Laville, M. 2001. Perceived job stress but not individual cardiovascular reactivity to stress is related to high blood pressure at work. *Hypertension* 38(1): 71-75.

Frost, M.R., Davis, M.M., King, D.S. and Jones, W. 1991. Therapeutic considerations in the treatment of obesity hypertension. *J. Clin. Hypertension* 4(3): 189-196.

Fucks, F.D., Chambless, L.E. and Whelton, P.K. 2001. Alcohol consumption and the incidence of hypertension: the atherosclerosis risk in community study. *Hypertension* 38: 1112-1117.

Gafoorinissa, F. and Krishnaswamy, K. 2000. *Diet and Heart Disease.* National Institute of Nutrition, Hyderabad, 79p.

Garrison, S., Paccuad, F., Bovet, P. and Burnier, M. 2001. Body mass index, abdominal adiposity and blood pressure: consistency of their association across developing and developed countries. *Int. J. Obesity* 26: 48-57.

George, V.V. 1992. Dietary fibres in health and disease. *Nutr. Plan.* 5: 40-41.

Gopalan, C., Sastri, B.V.R. and Balasubramanian, S.C. 1989. *Nutritive Value of Indian Foods.* National Institute of Nutrition, Hyderabad, 156p.

Gopaldas, T. and Seshadri, S. 1987. *Nutrition Monitoring and Assessment.* Oxford University Press, New Delhi, 221p.

Gupta, R. 1997. Meta- analysis of prevalence of hypertension in India. *Indian Heart J.* 49: 43-48.

Gupta, R. 2004. Trends in hypertension epidemiology in India. *J. Hum. Hypertension* 18: 73-78.

Gupta, R., Gupta, S., Gupta, V.P. and Prakash, H. 1995. Prevalence and determinants of hypertension in the urban population of Jaipur in Western India. *J. Hypertension* 13:1193-1200.

Gupta, R., Gupta, V.P. and Ahluwalia, N.S. 1994. Educational status, coronary heart disease and coronary risk factor prevalence in a rural population of India. *BMJ.* 309: 1232-1236.

Gupta, R., Gupta, V.P., Sarma, M. and Singh, A.K. 2002. Prevalence of coronary heart diseases and risk factors in an urban Indian population. Jaipur. Heart Watch-2. *Indian Heart. J.* 54(1): 59-56.

Gupta, R. and Sharma, A.K. 1994. Prevalence of hypertension and subtypes in an Indian rural population: clinical and electrocardiographic correlates. *J. Hum. Hypertens*ion 8: 823-829.

Gupta, S.P. 1987. *Statistical Methods.* Sulthan Chand Sons, New Delhi, 310p.

Gupta, S.P. and Gupta, V.P. 1994. Epidemiology of hypertension. *Indian Heart J.* 29: 53-62.

Haldia, K.R., Sachdev, R., Mathut, M.L. and Lakshminaraya, J. 2004. Epidemiology of essential hypertension in Arid population of Rajasthan. *Annual Report 2005-2006*. 56-58.

Hazarika, N.C., Biswas, D., Narain, K., Kalita, H.C. and Mahanta, J. 2002. Hypertension and its risk factors in tea garden workers of Assam. *Natl. Med. J. India* 15(2): 63-68.

He, J. and Whelton, P.K. 1997. Role of sodium reduction in the treatment and prevention of hypertension. *Cirr. Opin. Cardiol.* 12: 202-207.

Henauw, S.D., Bacquer, D.D., Fontenye, W., Stam, M., Kornitzer, M. and Backer, G.D. 1998. Trends in the prevalence, detection, treatment and control of arterial hypertension in the Belgian adult population. *J. Hypertension* 16: 277-284.

Henderson, R.J., Hart, M.G., Lal, S.K. and Hunor, S.N. 1998. The effect of home training with direct blood pressure biofeedback of hypertensives: a placebo-controlled study. *J. Hypertension* 16: 771-778.

Heyka, R.J. 1999. Lifestyle management and prevention of hypertension. *Am. J. Hypertension* 13(1): 44-51.

Hussain, S.A., Nayak, K.C. and Gupta, A. 1988. A study of prevalence of hypertension with reference to economic, educational, environmental and hereditary factors in general population of North- West Rajasthan. *Indian Heart J.* 40: 148-151.

Hypertension study group. 2001. Prevalence, awareness, treatment and control of hypertension among the elderly population in Bangladesh and India: a multicentre study. *Bull. Wld. Hlth. Org.* 78: 490-500.

ICMR. 1984. *Recommended Dietary Intake for Indians*. Indian Council of Medical Research, New Delhi, 80p.

ICMR. 1990. *Nutrient Requirements and Recommended Dietary Allowances for Indians*. Indian Council of Medical Research, New Delhi, 126p.

ICMR. 1994. Task force project on collaborative study of coronary heart study. *Sp. Rep. Ser.* 60p.

IOTF-WHO. 2000. The Asian Pacific perspective. Redefining obesity and its treatment. Caulfield, Victoria, International Diabetes Institute.

Immink, M.D.C., Sanjur, D. and Colon, M. 1981. Home gardens and the energy and nutrient intake of women and preschoolers in rural Puerto Rico. *Ecol. Fd. Nutr.* 11: 191-199.

Ingle, P.O. and Khari, D.N. 1987. Personal and socio economic status of agricultural labourers of Maharashtra. *J. Education* 6: 23-27.

Jansi, G. and Sarojini, G. 1991. Analogy of health and nutritional status of preschoolers in fishing families. *J. Res.* AAU 21: 2-15.

Jayanthakumari, S. 1993. Food consumption pattern of selected farm families in Thiruvananthapuram District. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 102p.

Jee, S.H., He, J. and Whelton, P.K. 1999. The effect of chronic coffee drinking on blood pressure. *Hypertension* 33: 647-652.

Jelliffee, D.B. 1966. *The Assessment of the Nutritional Status of the Community*. WHO Monograph Ser. 33, WHO, Geneva, 50p.

Jose, M.P. 1998. Maternal employment and nutritional status of preschool children. M. Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 154p.

Joseph, S. 1991. Girl child workers- A victim invisible. *Kurukshethra* 39: 11-14.

Jyothi, R. 2003. Nutritional profile of women labourers in rice cultivation. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 119p.

Kalavathy, M.C., Thankppan, K.P., Sarma, P.S. and Vasan, R.S. 2000. Prevalence, awareness, treatment and control of hypertension in an elderly community based sample in Kerala. *Natl. Med. J. India* 13: 9-15.

Kalpan, N.M. 1997. *Clinical hypertension* (7th ed.). Mc Graw- Hill Book Company, New York, 267p.

Kaplan, G.A. and Keil, J.E. 1993. Socio economic factors and cardio vascular disease. *Circulation* 88: 1973-1998.

Kaplan, G.A. 1998. *Hypertension management and control* (7th ed.). Mc Graw- Hill Book Company, New York, 256p.

Kearney, P.M., Whelton, M., Reynolds, K., Muntner, P., Whelton, P.K. and He, J. 2005a. Global burden of hypertension: Analysis of worldwide data. *Lancet* 365(9455): 217-223.

Kearney, P.M., Whelton, M., Reynolds, K., Muntner, P., Whelton, P.K. and He, J. 2005b. World wide prevalence of hypertension: a systematic review. *J. Hypertension* 22: 11-19.

Keil, U., Swales, J.D. and Grobbee, D.E. 1993. Alcohol intake and its relation to hypertension. *Cardiovascular Risk Factors* 3: 189-200.

Kok, F.J., Vandenbrouker, J.P. and Heide, V.R.M. 2002. Dietary sodium, calcium and potassium in blood pressure. *Am. J. Epidemiol.* 123: 1043-1048.

Konjuri, J. and Rahimi, R. 2007. Effect of 'no added salt diet' on blood pressure control and 24 hour urinary excretion in mild to moderate hypertension. *BMC Cardiovasc. Disord.* 7(1): 34-40.

Kotchen, T.A. 1997. Dietary sodium and blood pressure: interactions with other nutrient. *Am. J. Clin. Nutr.* 65(2): 708-711.

Krousel, M.A., Muntner, P., He, J. and Whelton, P.K. 2004. Primary prevention of hypertension. *Med. Clin. N. Am.* 88: 223-238.

Kutty, V.R. 1993. Prevalence of coronary heart disease in the rural populations of Thiruvananthapuram district, Kerala. *Int. J. Cardiol.* 39(1): 59-70.

Kutty, V.R., Soman, C.R., Joseph, A., Kumar, K.V. and Pisharody, R. 2002. Random capillary blood sugar and coronary risk factors in a South Kerala population. *J. Cardiovasc. Risk* 9(6): 361-367.

Lawrence, L. 2003. Household food security and nutritional status of women agricultural labourers. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 126p.

Lean, M.E.J., Han, T.S. and Morrison, C.E. 1995. Waist circumference as a measure for indicating need for weight management. *Br. Med. J.* 11: 638-641.

Lungershausen, Y.K., Abbey, M. and Nestel, P.J. 1994. Reduction of blood pressure and plasma triglycerides by omega- 3 fatty acids in treated hypertensives. *J. Hypertension* 12: 1041-1045.

Luskin, F.M., Newell, K.A., Griffith, M., Holmes, M., Telles, S. and Marvasti, F.F. 1998. A review of mind- body therapies in the treatment of cardiovascular diseases. *Altern. Ther. Health Med.* 4: 46-61.

Malhotra, P., Kumari, S., Kumar, R., Jain, S. and Sharma, B.K. 1999. Prevalence and determinants of hypertension in an un- industrialized rural population of North India. *J. Hum. Hypertension* 13: 467-472.

Mari, J. 1995. Individual dietary survey, purpose and methods. *Wld Rev. Nutr. Dietet.* 13: 105-161.

Mathen, M.M. 1998. Nutritional status and intelligence of pre school beneficiaries of ICDS and non beneficiaries of Thrissur District. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 152p.

Mbanya, J.C.N., Minkoulou, E.M., Salah, J.N. and Balkau, B. 1998. The prevalence of hypertension in rural and urban Cameroon. *Int. J. Epidemio.* 27: 181-185.

McCarron, D.A. 1991. A consensus approach to electrolytes and blood pressure: could we all be right. *Hypertension* 17(1): 1170-1172.

McLaren, D.S., Johnston, E.E., Lampl, M., Martorell, R., Waterlaow, J.C., Hansen, J.D.L. and Mora, J.O. 1984. Forms and assessment of protein energy malnutrition. In: Brozek, J. and Schurch, B. (eds.), *Malnutrition and Behaviour- Critical Assessment Key Issues.* Nestle Foundation, Switzerland, pp 130-135.

McMohan, S. 1987. Alcohol consumption and hypertension. *Hypertension* 9: 111 - 121.

Miura, K. 2005. Can dietary changes reduce blood pressure in the long term. *Curr. Opin. Nephrol. Hypertension* 14(3): 253-257.

Mohan, R. 1996. *Urbanization in India: patterns and emerging policy issues.* Oxford University Press, New York, 131p.

Mohan, V., Shanthirani, S., Deepa, R., Premalatha, G., Sastry, N.G. and Saroja, R. 2001. Intra- urban differences in the prevalence of the metabolic syndrome in Southern India- the Chennai urban population study. *Diabet. Med.* 18(4): 280-287.

Morris, M.C., Sacks, F. and Rosner, B. 1993. Does fish oil lower blood pressure? A meta- analysis of controlled clinical trails. *Circulation* 88: 533-553.

Nakagawa, H. 2005. Dietary influences on blood pressure: the effect of the Mediterranean diet on the prevalence of hypertension. *J. Clin. Hypertension* 7(3): 165-170.

Nakao, M., Nomura, S., Shimosawa, T., Fugita, T. and Kuboki, T. 2000. Blood pressure biofeed treatment of white- coat hypertension. *J. Psychosom. Res.* 48: 161-169.

Nissien, A., Bothing, S. and Black, H.R. 1998. Hypertension and its risk factors. *Wld. Hlth. Statist. Quart.* 4(1): 151-156.

Nissinen, A., Bothing, S., Granroth, H. and Lopez, A.D. 1988. Hypertension in developing countries. *Wld. Hlth. Statist. Quart.* 41: 141-154.

Pai, D.M. and Halani, M.G. 2006. High blood pressure in slum dwellers. In: Shah, N.J. and Singhri, P. (eds.), *Clinical Hypertension- Proceedings of the International Congress on Hypertension in Bombay.* New Thackers Fine Art Press, Bombay, pp. 789-792.

Patel, C. 1995. Twelve month follow to yoga and bio- feed back in the management of hypertension. *Lancet* 1(7898): 62-64.

Paul, A.M. 1999. *Lifestyle management in hypertension.* IJCP Group of publications, 280p.

Pobee, S.C., Swain, P.K., Sunderam, K.R. and Malhotra, K.K. 2000. Hypertension epidemiology in an Indian Tribal population. *J. Asso. Phy. India* 34: 567-570.

Prema, A. 1996. Income, savings and capital formation in farm households of Kodakara development block. M.Sc (Agriculture) thesis, Kerala Agricultural University, Thrissur, 147p.

Puddey, I.B., Beilin, L.J., Vandongen, R. and Masarei, J.R. 1992. Effects of alcohol and calorie restriction on blood pressure and serum lipids in over weight men. *Hypertension* 20: 533-541.

Rajyalakshmi, P. 2000. *Classification and clinical types of obesity.* In: Current concepts on obesity and health. Centre of Advanced Studies, Post Graduate and Research Centre, ANGRAU, Hyderabad. p 12-18.

Rao, D.H. and Vijayaraghavan, K. 1996. Anthropometric Assessment of Nutritional Status. In: Bamji, M.S., Rao, P.V. and Reddy, V. (eds.), *Text Book of Human Nutrition.* Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 507-515pp.

Reaburn, J.A., Krohdle, M. and Lan, D. 1979. Social determinants in food selection. *J. Am. Dietet. Ass.* 74: 637-641.

Reddy, K.S. 1996. Hypertension control in developing countries: generic issues. *J. Hum. Hypertension* 10: 33-38.

Reddy, K.S. 2004. Cardio vascular disease in India. *Wld. Hlth. Stat.* 46: 101-107.

Reddy, K.S. and Yusuf, S. 1998. Emerging epidemic of cardiovascular disease in developing countries. *Circulation* 97: 596-601.

Reed, D., McGee, D., Yano, K. and Hankin, J. 1985. Diet, blood pressure and multicollinearity. *Hypertension* 7: 405-410.

Richard, E. and Klabunde, P. 2007. Cardiovascular Physiology Concepts (Online). Available: *http:// www. Cvpharmacology.com.* (20 March 2007).

Sacks, F.M., Svetlery, L.P. and Vollmer, W.M. 2001. Effects on blood pressure of reduced sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. *N. Engl. J. Med.* 344: 3-10.

Saxena, K.J. 1986. The joint and nuclear family- A personal experience. *Indian J. Social Work.* 6: 32-36.

Schofield, S.M. 1985. *Development and Problems of Village Nutrition (Part III).* The English language Book Society and Crom- Helm, London, 175p.

Seshadrinath, R. 1993. The factors influencing the intrafamily distribution of food among agricultural labourer families of Thiruvananthapuram with special reference to nutritional status. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 152p.

Shanthirani, C.S., Pradeepa, R., Deepa, R., Premalatha, G., Saroja, R. and Mohan, V. 2003. Prevalence and risk factors of hypertension in a selected South Indian population. *J. Ass. Physician India* 51: 20-27.

Shyna, P.K. 1996. Nutritional profile and mental functions of preschool children belonging to agricultural labourer families in Thrissur District. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 101p.

Singh, R.B. 1995. Epidemiological study of coronary artery disease and its risk factors in an elderly urban population. *J. Am. Coll. Nutr.* 14: 628-634.

Singh, R.B., Beegum, R., Mehta, A.S., Naiz, N.A., De, A.K. and Haque, M. 1998. Prevalence and risk factors of hypertension. *Hypertension* 7(1): 43-76.

Singh, R.B., Rastogi, S.S. and Singh, N.K. 1997. Social class and coronary artery disease in a rural population of North India: The Indian Social class and Heart survey. *Euro. Heart J.* 45: 841-847.

Sivakumar, B. 2000. *Current concepts in body composition method of body composition analysis.* In: Current Concepts on Obesity and Health. Centre of advanced studies, Post Graduate and Research Centre, ANGRAU, Hyderabad, 36-42.

Smitha, M.E. 1999. Food consumption pattern and nutritional status of women agricultural labourers of Ollukkara block, Thrissur district. M.Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur, 119p.

Srilakshmi, B. 2005. *Dietetics*. New Age International Pvt. Ltd., New Delhi, 357p.

Stamler, J., Caggiula, A.W. and Grandits, G.A. 1997. Relation of body mass and alcohol, nutrient, fibre and caffeine intakes to blood pressure in the social

intervention and usual care groups in the Multiple Risk Factor Intervention Trail. *Am. J. Clin. Nutr.* 65: 338-365.

Stamler, R. 1994. *The primary prevention of hypertension and population blood pressure problem.* Oxford University Press: Oxford, 415p.

Swaminathan, M.C. 1987. Non invasive parameters for field monitoring and evaluation: their sensitivity, specificity and cost. In: Gopaldas, T. and Seshadri, S. (eds.), *Nutrition Monitoring and Assessment.* Oxford University Press, New Delhi, pp.22-25.

Thimmayamma, B.V.S. and Rau, P. 1996. Dietary assessment as part of nutritional status. *In:* Bamji, M.S., Rao, N.P. and Reddy, V. (eds.), *Text Book of Human Nutrition.* Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, pp.130-135.

Tunstall, P.H., Woodward, M. and Tavendale, R. 1997. Comparison of the prediction by 27 different factors of coronary heart disease and death in men and women of the Scottish Heart study: Cohort study. *BMJ.* 315: 544-549.

Udaya, P.K. 1996. Food consumption pattern and nutritional status of farm women in Thrissur district. M. Sc. (Home Science) thesis, Kerala Agricultural University, Thrissur. 99p.

Usha, V., Suja, P,T. and Prema, L. 1990. The nutritional status of farm women ofinstructional farm, Vellayani. Workshop on Women in Agriculture. *Background Papers.* NIN, Hyderabad, pp 35-45.

Varma, M., Dave, J., Vaidya, M., Maheshwari, R. and Narang, S. 2007. Effect of complete antioxidant tablet on plasma antioxidant enzymes, lipid peroxidation rate, lipid profile and uric acid levels in obese and alcoholic hypertensive patients. *The Indian J. Nutr. Dietet.* 44: 397-401.

Vasan, R.S., Beiser, A. and Sheshadri, S. 2002. Residual lifetime risk for developing hypertension in middle- aged women and men: the Framingham Heart study. *JAMA* 287: 1003- 1010.

Vasan, R.S., Larson, M.G., Leip, E.P., Kannel, W.B. and Levy, D. 2001. Assessment of hypertension in hypertensive patients in the Framingham Heart study: a cohort study. *Lancet* 358: 1682- 1686.

Venkitalakshmi, P. and Peramma, D. 2000. Body weight and physical work capacity. *The Indian J. Nutr .Dietet.* 37: 255-258.

Vijayaraghavan, K. 1987. Anthropometry for assessment of nutritional status. *Indian J. Paediatrics* 54: 511-520.

Wasir, H.S., Ramachandran, R. and Nath, L.M. 1984. Prevalence of hypertension in a closed urban community. *Indian Heart J.* 36: 250-260.

Whelton, P.K. 1994. Epidemiology of hypertension. *Lancet* 344: 101-106.

Whelton, P.K. and He, J. 1999. Potassium in preventing and treating high blood pressure. *Semin. Nephrol.* 19: 494-499.

Whelton, P.K., He, J. and Cutler, J.A. 1997. Effects of oral potassium on blood pressure meta- analysis of randomized controlled clinical trials. *JAMA* 277:1624-1632.

Whelton, S.P., Chin, A., Xin, X. and He, J. 2002. Effect of aerobic exercise on blood pressure: a meta analysis of randomized controlled trials. *Ann. Int. Med.* 136: 493-503.

WHO. 1983. *Smoking control strategies in developing countries*. World Health Organization, Geneva, 695p.

WHO. 1993. World Health. World Health Organization Magazine. 3: 298-301.

WHO. 2001. *Diet, nutrition and prevention of chronic diseases*. World Health Organization, Geneva, 234p.

WHO. 2002. *The World Health Report 2002: Reducing Risks, Promoting Healthy Life*. World Health Organization, Geneva, 766p.

WHO. 2003. *Project on sentinel surveillance of Indian Industrial population*. World Health Organization, Geneva, 867p.

WHO-ISH. 2005. Guidelines for the management of hypertension. *J. Hypertension* 17: 151-183.

Wingard, D.L. and Barett, C.E. 1995. *Heart disease and diabetes*. In. Diabetes in America. Washington, DC, US, Govt. Printing office, pp .429-448.

Wright, A., Burstyn, P.G. and Gibney, P. 1999. Dietary fibre and blood pressure. *Br. Med. J.* 2: 1541-1543.

Xin, X., He, J., Frontoni, M.G. and Ogden, L.G. 2001. Effect of alcohol reduction on blood pressure. *Hypertension* 38: 1112-1117.

Zachariah, M.G., Thankappan, K.R., Alex, S.C., Sarma, P.S. and Vasan, R.S. 2003. Prevalence, correlates, awareness, treatment and control of hypertension in a middle aged population in Kerala. *Indian Heart J.* 55: 245-251.

Appendices

APPENDIX I

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

COLLEGE OF HORTICULTURE, VELLANIKKARA, THRISSUR

DEPT. OF HOME SCIENCE

Interview schedule to elicit information regarding the socio-economic conditions of the families

1. Name of the respondent :
2. Address :
3. Place of Survey :
4. Panchayath, House No. Ward :
5. Age of the respondent :
6. Type of the family : Joint / Nuclear
7. Religion / Caste :
8. Family size :

   No. of adults :

   No. of children :
9. Marital status : a) Married (b) Unmarried
   c) Divorced/Separated (e) Widowed

10. Composition, education and occupation of family members

Sl. No.	Name	Relation-ship with the head	Age	Sex	Occup ation	Educational status				Income per month
						Illite-rate	Primary school	H.S.	College	

11. Do you have any other source of income:

a) If yes, specify :

b) Amount :

12. Do you have your own land : Yes / No

i) If yes, specify area under cultivation:

13. Details regarding the cultivation of crops

Sl. No.	Name of crop	Area cultivated	Total produce per year	Quantity used at home	Quantity sold	Income

14. Do you have any domestic animals: Yes / No

If yes, details regarding domestic animals

Domestic animals	How many	Source of domestic animals			
		Purchased	Gift	Government	Inherited
1. Cattle a) Cow	1 2 3 4 More than 4				
b) Buffalo	1 2 3 4 More than 4				
c) Goat	1 2 3 4 More than 4				

d) Pork	1 2 3 4 More than 4				
2. Poultry a) Hen	1 2 3 4 More than 4				
b) Duck	1 2 3 4 More than 4				

15. Details of produce from domestic animals

Sl. No.	Name of product	Quantity produced per year	Use of produce			Income
			By family	Gift	Sale	

16. Do you have a kitchen garden: Yes / No
If yes, specify
Items of cultivation and use of produce

Item	Use of produce		
	By family	Gift	Sale

17. Have you taken any loan? : Yes / No

If yes, specify

Sl. No.	Source of loan	Amount of loan	Purpose

18. Monthly expenditure pattern

Sl. No.	Items	Amount spent per month	Percentage of total income
1	Food		
2	Clothing		
3	Shelter		
4	Transport		
5	Recreation		
6	Education		
7	Electricity		
8	Health		
9	Fuel		
10	Luxury and personal		
11	Remittance		
12	Savings		

19. Details of housing conditions

i) Type of house

a) Own house / Rented house
b) Mud built / Brick built
c) Thatched / Tiled / Terraced
d) Single storeyed / Double storeyed
e) No. of rooms: 1 / 2 / 3 / 4 / 5 / more

ii) Other characteristics

a) Separate kitchen : Yes / No
b) Source of drinking water: Own well/ Public tap/ Public well/ Tank/ River
c) Lavatory facilities: Own latrine/ Public latrine/ Open field
d) Drainage facilities: Yes / No
e) Electrical facilities: Yes / No
f) Recreational facilities: Yes / No
If yes, specify: Radio / Transistor/ Television/ VCR
g) Transport facilities: Bus/ Bicycle/ Motor bike/ Jeep

20. Details regarding use of fuel

i) Type of fuel
a) Wood
b) Agricultural waste
c) Cow dung
d) Saw dust
e) Kerosene
f) LPG
g) Others

ii) Source of fuel

a) Collected from surroundings
b) Purchased

21. When anybody is ill do you make use of health centre? Yes/No.

If yes, specify
a) Primary Health Centre
b) Private Hospital
c) Medical College
d) Maternal and Child Health Centre
e) Ayurvedic
f) Homoeopathic
g) Others

22. Epidemics prevalent in the locality in the past one year
a) Measles
b) Chicken pox
c) Whooping Cough
d) Typhoid
e) Others

ii) Was any member of the family affected? Yes/No.

If yes, specify: Name of Disease

23. Details of time expenditure pattern

a) Number of working hours per day:
b) Hours spent for household activities:
c) Sleeping time
1. Wakes up at :
2. Goes bed at :

24. Details of working pattern of the respondent

a) Are you a permanent employee of an organization: Yes/No.
If yes, when did you join for work?:

b) How many days you get work in a week:

c) Do you have any off day in a week: Yes/No.
If yes, give details:

d) How frequently you go for work: Daily/Weekly once/Weekly twice/Occasionally

e) At what time do you go for work:

f) How many hours you get interval: Morning/Lunch/Evening

g) At what time you return from work:

h) If you are not going for work daily give reasons:

i) No work in the field
ii) Work seasonal
iii) Health problem(specify)
iv) Nobody to look after children
v) Low wage
vi) Tedious
vii) Others (Specify)

m) Do you go for any other work during off days: Yes/No.

If yes, give details

Details of work	Days	Wage

n) Do you get work daily during summer & rainy season? Yes/No.

If yes, give details

Season	Number of days/week	Wage/day

25. Details regarding personal habits

Do you have the habit of

a) Smoking : Yes/No

If yes, number of cigarettes/day

b) Tobacco chewing : Yes/No

If yes, frequency of use

c) Alcohol consumption : Yes/No

If yes, frequency of use

d) Others (specify)

26. Details regarding exercise

a) Do you take any physical exercise daily : Yes/No

If yes, give details

Type of exercise	Duration/time	Frequency		
		Daily	Weekly once	Weekly twice

27. Medical history of the family

. Are you taking any medicines for any diseases regularly: Yes/No

If yes, specify the disease

Type of medicine taken : Allopathy
Homeo
Naturopathy
Ayurveda

28. Details regarding hypertension

a) Do you take blood pressure measurement regularly : Yes/No
If yes, specify the frequency of measurement

29. Family history of hypertension

a) Has anybody your family is having hypertension: Yes/No
If yes, specify

Members	Age at which hypertension was noticed
Myself	
Mother	
Father	
Husband	
Wife	
Children	
Brothers	
Sisters	

30. Mode of commutation : Bus/Bicycle/Motor Bike/Jeep/others

31. Personality traits :

APPENDIX II
INTERVIEW SCHEDULE TO COLLECT INFORMATION ON FOOD CONSUMPTION PATTERN OF THE RESPONDENTS

1. Name of the respondent :
2. Age :
3. Sex :
4. Address :
5. Place of survey :
6. Panchayath :
7. Block :
8. Food habit : Vegetarian/Non-vegetarian
9. Name of staple food :
10. Details of food expenditure :

11. Details of frequency of use of various food items

Sl. No.	Food items	Frequency of use in a week				Monthly	Occassi-onally	Never
		Daily	Thrice	Twice	Once			
1	Cereals							
2	Pulses							
3	Green leafy vegetables							
4	Other vegetables							
5	Roots and tubers							
6	Fruits							
7	Oils and fats							
8	Spices and condiments							
9	Milk and milk products							

10	Meat							
11	Fish							
12	Egg							
13	Sugar							

12. Details about frequency of meals per day

Once/Twice/Thrice/More than three

13. Details about meal planning

Do you plan your meals in advance? Yes/No.

If yes, what is the basis of planning?

a) Total family requirement
b) Food stuffs available

14. a) Do you impose any restriction in food to control hypertension? Yes/No

If Yes, give details

If No, give reasons

b) Do you include any specific food item in your daily diet to control hypertension? Yes/No

If Yes, give details

Name	Quantity	Frequency of use	Reason

15. Do you use oils for cooking? : Yes/No
If Yes, specify

a) Mustard oil
b) Vanaspathi
c) Groundnut oil
d) Rapeseed oil
e) Ghee

f) Butter
g) Coconut oil
h) Vegetable oil (specify)
i) Others

16. Do you use pickles daily? : Yes/No

17. Do you use pappads? : Yes/No
If Yes, give details

18. Do you use fried food items frequently? Yes/No

If Yes, specify

Type of food item	Frequency of use

19. Details of salt intake

i) Do you use salt daily? Yes/No
If yes, specify
ii) Do you impose any restriction in the intake of salt? Yes/No
If Yes, give details
iii) Do you use dried fish? Yes/No

PREVALENCE OF HYPERTENSION AND ASSESSMENT OF RISK FACTORS AMONG AGRICULTURAL LABOURERS

By

ARCHANA, S. S

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)

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2008

ABSTRACT

A study on "Prevalence of hypertension and assessment of risk factors among agricultural labourers" was carried out among male and female labourers of Kerala Agricultural University, Thrissur district. A total of 150 agricultural labourers were selected randomly for the study and were grouped as control (non hypertensive) and experimental groups (hypertensive).

The details on socio economic status, personal habits, working pattern, food consumption pattern and nutritional status were collected from the respondents.

Information regarding socio economic condition of the families revealed that most of the families in control and experimental groups were Hindus and belonged to forward caste with a family size of 4 to 6 members.

Educational status of respondents showed that majority in control and experimental groups were literates.

Most of the families in both control and experimental groups owned up to 10 cents of land. Majority of the families in both groups did not have kitchen garden and domestic animals. Monthly income of the families in both groups varied from Rs. 4000 to 10, 000. Maximum proportion of income was spent on food items. Majority of the families in both groups did not have the habit of saving money for future purposes. Most of the families in both groups borrowed money from different sources.

Most of the families in control and experimental groups had their own houses with brick as the wall material and tiles as the roofing material with 2 to 3 rooms. Drinking water, electricity, recreational and lavatory facilities were found to be satisfactory. Majority of the families in both groups used wood as source of fuel.

About 24 per cent of the male respondents in control and 64 per cent in experimental groups had the habit of smoking. About 12 to 24 per cent respondents in control group and 46 to 50 per cent of respondents in experimental group had the habit of tobacco chewing. Majority of respondents in both groups did not have the habit of taking regular physical exercise.

Majority of the respondents in both groups worked for 6 days in a week for 6 to 7 hours daily.

Most of the respondents in both groups were non vegetarians and consumed rice as their staple food.

The most frequently used food items were cereals, pulses, other vegetables, milk and milk products, fats and oils, sugar, salt, fish and spices and condiments in control group while in experimental group all the above food items except pulses were found to be the most frequently used food items.

Advance meal planning was popular in both groups with three meals a day pattern.

Majority of the respondents with hypertension used coconut oil for cooking and used pickle, pappad, dried fish and fried food items daily. None of the respondents neither included nor restricted food to control hypertension.

Grade 1 obesity was observed among 27 per cent of respondents in experimental group and 24 per cent in control group. Nearly 22 per cent respondents in experimental group and 16 per cent in control group were found to be at risk for obesity. Most of the male respondents had waist hip ratio less than 0.95 while 84 per cent females in experimental group had a waist hip ratio above 0.85.

One day food weighment survey indicated that the mean intake of all food items and all nutrients was lower than the recommended allowances in both male and female respondents.

About 53.68 per cent male and 49.8 per cent female agricultural labourers had stage 1 hypertension. Among the respondents with hypertension selected for the study 90 to 98 per cent of respondents also had stage 1 hypertension.

Type of family, family size, use of pickle, pappad, fried food items, smoking, tobacco chewing, alcohol consumption, lack of regular physical exercise, personality traits, family history of hypertension, body mass index and waist hip ratio were identified as the risk factors for hypertension among agricultural labourers.