Dietary Intake of Hypertensive Patients and the Effect of Four Foods that Lower Hypertension

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Introduction

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I. INTRODUCTION

Cardiovascular diseases have been aptly called 20th century diseases. They are the leading cause of death among men and second or 3rd leading cause of death among women. Of the cardiovascular diseases in India by about 20-25% suffer from hypertension. Hypertension is most important risk factor underlying the development by cardiovascular disease. Hypertension is symptomless in that the sufferer detects no malaise (Barlow 1983). However on diagnosis, hypertensive patients develop symptoms even before the treatment commences. Therefore according to Pareek (1990) hypertension has been rightly called the "silent killer" and is one of the leading cause of mortality and morbidity today.

The main predisposing factors are heredity, obesity and undoubtedly the stress and strain of modern life. The heart during systole pumps blood in the elastic arteries that stretch. The recoil of arteries exerts diastolic pressure that serves to maintain the blood flow during distole. Pumping blood against a raised diastolic pressure strains the heart muscle. The World Health Organisation (WHO 1981) defines hypertension as a state in which the sitting blood pressure exceeds 160/95 mm Hg. It is further classified as mild, moderate or severe when the diastolic blood pressure are between 95 to 104, 105 to 114 and 115 mm Hg and above respectively.

Untreated hypertension reduces the lifespan by 20 years in severe hypertension and 6-10 years in mild to moderate hypertension (Medical Times 1989). Hypertension underlies a whole variety of cardiovascular diseases including angina pectoris, acute myocardial infarction with or without complications, atherosclerotic obstruction of the aorta, strokes renal failure, sudden death, hypertensive intracerebral haemorrhage, lacunarstrokes, multi infarct state and hypertensive encephalopathy.

Incidences of hypertension are found through out the world. Sailapathy (1981) says that most cases were between 40-60 years. According to Dahl (1981) approximately 25% of all individuals exposed to a high carbhohydrate, high saltdiet will have noticebly higher blood pressures than the others. Sainani (1987) says that mild hypertension forms 75% of the entire hypertension population and if the prevalence rate of 10% is accepted than there will be about 80 million hypertensives in India of which 60 million would be mild hypertensives.

Dwyer (1988) indicates that in western and developing countries vegetarian groups such as Buddishts have lower systolic and diastolic blood pressures than non vegetarians. Blood pressure is generally thought to increase with age in western societies says Toru Riki et al. (1988), however there are communities including highlands of Papua New Guinea where blood pressure does not

increase with age. Vaughon (1979) proves that certain life styles are associated with an almost complete absence of hypertension and with blood pressure that do not rise with age as among African nomads and African peasants. Paul Dodson (1980) indicates that 40 million people in the United States and 10 millions in United Kingdom may be classed as hypertensives.

In India more than 90% of hypertensives have essential hypertension (Carolyn Hoffman 1989). As many as 40-60% of those aged at 65-74 years in several populations are labelled as hypertensives and 50-85% have at least mild hypertension. Of all hypertension in the world the great majority is mild hypertension of the elderly and Kannel (1980) says that 30-60% of all cardiovascular diseases in the elderly can be attributed to mild or severe hypertension.

Hypertension is prevalent all over the world. In India it has been noted in 10-15% of the population Gouri Pada Dutta (1987). In industrial enterprises the prevelance of arterial hypertension ranged from 17%-30% (Oganov, 1988). In males mortality with blood pressure of 160/90 is atleast 2½ times compared to those with arterial blood pressure of 130/80 or less says Williams and Braunwald (1987). According to Sailapathy (1981) in Tirunelveli district in Tamil Nadu there is an increased incidence of hypertension, and males were found to be more hypertensive than females.

Many reasons contribute to the occurence of hypertension in men. Renal diseases may cause hypertension or aggrevate the security of preexisting hypertension. According to Gennser (1988) being born small for gestational age may be a prediction of raised blood pressure in early adult life. Obese people are more prone to hypertension than normal weight individuals. Stress related to social and occupational factor is thought to be associated with increased hypertension. The other reasons for the occurence of high blood pressure are increased consumption of fat, saturated fats, alcohol, sodium rich foods, salt intake, high protein foods, Cholestrol rich foods, non vegetarian items and gas producing foods.

The dietary treatment includes a reduction in the Sodium, salt intake, oil and fats, alcohols, consumption of vegetarian foods, a diet rich in fibre and potassium. It was found out experimentally that fish oils were hypotensive in effect. Inclusion of soft water in abundance was found to be beneficial, and an increase in the dietary linoleic and eicopentaenoic acids and the complete stoppage of smoking and alchol consumption.

According to Sheth (1988) says that by using non pharmacological means it is possible to reduce Blood Pressure by 15% in patients with mild to moderate hypertension so therefore mild to moderate hypertension can be managed by non drug therapy.

Hence this study on the dietary intake of hypertensive patients and the effect of foods that lower hypertension has been taken to find out whether hypertension can also be treated by non pharmacological methods. The objectives of the study are:

1. To study the socio economic profile of hypertensive patients

2. To study the food consumption patterns of hypertensive patients (males and females) in Coimbatore city.

3. To find out the effect of four foods in lowering hypertension in terms of decrease in blood pressure and serum cholestrol.

4. Identifying and recommending foods that can be included in the diet of hypertensive patients which help to reduce hypertension.

Review of Literature

II. REVIEW OF LITERATURE

The literature pertaining to the present study "dietary intake of hypertensive patients and the effect of four foods that lower hypertension" is presented under the following heads:

A Hypertension - The Silent Killer

B Factors Preciptating Hypertension

C Effect of different foods on Hypertension

A. HYPERTENSION - THE SILENT KILLER

Hypertension has been identified as the single most important risk factor for the causation of cerebrovascular accidents. Directly or indirectly it is linked to the causation of all varieties of stroke.

The degree of risk of cardio vascular disease corresponds to the degree of elevation of both systolic and diastolic pressures. The influence of hypertension in the causation of stroke is equally important in both males and females and in all age groups. Systolic blood pressure is as important as diastolic and because of its high prevalence in the elderly is actually the more potent contributor. The risk with mild diastolic hypertension levels out at about 90mm Hg and treatment between 90-95mm Hg is of uncertain value. Hypertension is progressive in nature which greatly curtails life expectancy if untreated (Walwaikar 1989).

DEFINITION

According to Macleod (1984) hypertension is defined arbitrarily at levels above generally accepted 'normals' for example 140/90 at the age of 20, 160/95 at the age of 50 and 170/105 at the age of 75. It is recommended that the phase V diastolic pressure be used in defining hypertension. Excercise, anxiety, discomfort and unfamilial surroundings smoking, consuming alcohol can all lead to a transient rise in blood pressure, and the measurements should be

repeated under basal conditions with the patient resting and relaxed until consistent readings are obtained.

Sheth (1988) indicates, that according to the World Health Organisation criteria blood pressure of 140/90mm Hg and below in an adult is normal whereas readings of 160/95 and above indicate hypertension. Blood pressure between 140/90 and 159/95mm Hg are termed as borderline hypertension. Labile hypertension refers to an occassional elevation of blood pressure above 160/95mm Hg.

Beckman (1981) says that borderline hypertension is said to be present when a patient has an arterial pressure that is raised at some times and is normal at others.

Messerli (1989) says a patient is said to have established essential hypertension if his blood pressure exceeds 160/95mm Hg. Three seperate blood pressure readings should be taken on two subsequent visits with an interval of 2 weeks between each visit. For clinical purposes hypertension must be defined as a blood pressure level that significantly increases the risk of future cardiovascular morbidity and mortality in a given patient.

Gifford (1989) defines isolated systolic hypertension as a systolic blood pressure of 160mm Hg or greater with a diatolic pressure less than 90mm Hg.

According to Friedrich (1990) hypertension is arbitrarily defined as a systolic pressure equal to or greater than 160mm Hg and/or a diastolic pressures equal to or greater than 95mm Hg during most of the pressure readings. The terms 'mild', 'moderate', moderately severe hypertension are commonly used in a descriptive sense and are not defined precisely. A value approach may be suggested by the use of increases in diastolic pressure in steps of 10mm Hg between 95mm Hg and beyond 125mm Hg ie 'mild' = 95-104 mm Hg, 'moderate' = 105 to 114mm Hg, 'moderately severe = 115 to 124mm Hg, 'severe' = 125mm Hg or higher.

CLASSIFICATION

According to Sheth (1988) hypertension is classified on the basis of diastolic blood pressure. Pressures between 95 and 104mm Hg constitute mild hypertesion between 105 and 114mm Hg moderate hypertension and over 115 severe Hypertension.

The normal classification of hypertension is as follows:

I. Pulmonary Hypertension

II. Systemic Hypertension

A. Systolic hypertension only

1. Increased stroke volume

a. Thyrotoxicosis

b. Anaemia

c. Heart Block

d. Arteriovenous fistula

2. Rigidity of the aorta

a. Artherosclerosis

B. Combined systolic and diastolic hypertension*

1. Renal

2. Pyelonephritis

3. Glomerulonephritis

c. Congenital lesions

d. Obstructive lesions

2. Endocrine

a. Acromegaly

b. Adrenal cortical hyperfunction

1. Aldosteronism

2. Cushing's syndrome

c. Pheochromocytoma

3. Neurogenic

a. Brain Tumour

b. Cerebrovascular accidents

c. Poliomyelitis

4. Unknown Etiology

a. Essential Hypertension

b. Eclampsia

* Any of the conditions associated with diastolic hypertension may become rapidly progressive (malignant)

INCIDENCES AND CLINICAL FEATURES OF HYPERTENSION

INCIDENCES

According to Lucas (1990) the vast majority of hypertensive patients (92-94%) suffer from essential or primary hypertension.

The prevalence of isolated systolic hypertension in subjects aged 60 to 69 varied from 23.1% in black males to 38-1% in white females - Ray Gifford (1989).

According to Khairy Dayer (1989) hypertension is a very common disease, and occurs in 23.1% of those aged 30-69 years. In the United States it has been estimated that nearly 60 million individuals have blood pressures greater than 140/90mm Hg.

According to the Health and Nutrition Examination surveys (1984) more than 34,000 Americans have high blood pressure. The condition is 50% prevalent among black than among white.

Parameshvara (1989) indicates that genetic factor may be inherited as a mendelian dominant. If both parents are hypertensive, the chances for the children developing hypertension are more than 50% and approximately 90% of hypertension is of uncertain origin, and is called primary hypertension. The remaining 10% termed

secondary hypertension is associated with a variety of causes namely renal endocrine and vascular disorders. He also states that the effect of salt on hypertension is indirect. It is known since long that diminished intake of salt results in lowering of blood pressure. Eskimos consume less salt and hence the incidence of hypertension is low in them. Japanese who consume as much as 20-35g of salt per day have a high incidence of hypertension.

Mansharamani et al.(1989) says that hypertension is the leading cause of morbidity and mortality in western countries. It is more common in Indian immigrants in USA and UK.

Gorbon Smith (1987) showed that early studies seemed to show that men in jobs calling for most physical activity were at lower risk but it is possible that men who are less fit and at greater risk of cardio vascular diseases for other reasons may choose less active occupation.

CLINICAL FEATURES

In the majority of the patients there are no specific symptoms attributable to hypertension, which is detected on routine examinations or because of one of its complications. Acute hypertension occasionally causes headache or polyuria. Long standing hypertension leads to left ventricular hypertrophy and may be

indicated by a forceful or substained apical impulse. Leftatrial hypertrophy may accompany that of the left ventricle and a fourth heart sound may be heard. Paroxysmal nocturnal dyspnoea and crepitations at the lung bases may give evidence of left ventricular failure.

The three main objectives of clinical examination in a hypertensive patient are to identify any underlying cause to recognise risk factors for the development of complications and to detect any complications already present.

Patients with phaeochromocytoma some times give a history of panic attacks, paroxysmal headaches or palpitation. The history of recurrent back ache or undiagnosed fever is sometimes due to chronic pyelonephritis. The characterictics features and habitus of cushing's syndrome may be recognised.

It is important to identify risk factors such as smoking, obesity and hyperlipidaemia which may interact with hypertension particularly in the genesis of ischaemic heart disease.

COMPLICATIONS IN HYPERTENSION

Hypertension can be very damaging because of two primary effects.

i. increased work load on the heart

ii. damage to the arteries themselves by the excessive pressure

EFFECTS OF INCREASED WORK LOAD ON THE HEART

The cardiac muscle hypertrophies when its work load increases. In hypertension, the very high pressure against which the left ventricle must beat causes an increase in weight as much as 2 to 3 fold (Marshall and Barrit 1981). Therefore relative ischaemia of the left ventricle develops or the hypertension becomes more and more severe. In the last stages of hypertension this may become serious and the person may develop angina pectoris, and the developments of coronary arteriosclerosis also occurs so that hypertensive patients tend to die of coronary occlusion.

EFFECTS OF THE HIGH PRESSURE IN THE ARTERIES

Effect of high pressure in the arteries not only causes coronary sclerosis but also sclerosis of blood vessel throughout the body. The arteriosclerosis process causes blood clots in the vessels and causes weakening of the blood vessels. The two important types of damage that occur in hypertension are

i. cerebral haemorrhage

ii. haemorrhage of renal vessels

The adverse effect of hypertension principally also involves, the central nervous system, the retina and the kidneys.

CENTRAL NERVOUS SYSTEMS

Hypertensive encephalopathy is a rare condition characterised by a very high blood pressure and neurological symptoms including transient disturbances of speech or vision, fits and loss of consciousness.

RETINA

The major change due to hypertension is the thickening of the walls of the retinal arterioles, causing the appearnce of a-rteriovenous nipping. With more severe hypertension retinal haemorrhages are seen and are usually flame shaped.

KIDNEYS

In addition to being a cause, renal disease may also be a result of hypertensive damage to the renal vessels. Long standing hypertension may cause proteinuria and progressive renal failure. Sometimes renal damage produces an increase release of rennin and a vicious circle may be set up with worsening renal failure and very severe hypertension.

B. FACTORS PRECIPITATING HYPERTENSION

High blood pressure is one of the major sources of chronic ill-health and premature death in the modern society. There are numerous factors that influence hypertension and they are as follows:

a. HEREDITY

According to Swadeshi (1987) indicates a new theory that states that hypertension is rooted in certain alterations of cell membranes which in turn have been conditioned by hereditary factors.

b. PHYSICAL ACTIVITY AND EXERCISE

Physical activity protects against heart disease and leads to a longer life. Isometric exercise such as weight lifting, pushing and pulling tends to raise blood pressure, but isotonic exercise reduces blood pressure and coincidental weight loss further helps in reduction.

c. ALCOHOL

It has been shown for some 70 years that there is an association between high alcohol consumption and elevated blood

pressure. It was concluded that regular use of three or more drinks per day is associated with increased risk of hypertension, while regular use of two drinks or fewer per day does not carry such a risk. Heavy drinking clearly increases likelihood of hypertension (Cooke et al, 1982). Heavy drinking is one of the leading causes of premature death in middle aged men in Sweden.

d. STRESS

Stress is the major cause of high blood pressure. Excessive stress leads to insomnia, irritability head aches and palpitations.

e. OBESITY

Obesity has long been recognised as one of the major risk factors for the development of hypertension. Obesity is strongly correlated with both systolic and diastolic blood pressure levels in cross sectional studies. Longitudinal studies show that weight gain is associated with increase in blood pressure.

f. SMOKING

Smoking increased the heart rate systolic and diastolic blood pressure and venous carboxy hemoglobin. Strasser (1982) says that smoking is one of the risk factors for coronary heart failure.

Nicotine has a variety of potentially relevant cardiovascular effects, it is known to raise systolic blood pressure and cardiac output, it increase the amount of free fatty acids which may promote arthero'scelerosis (Kaufmann et al. 1983).

g. NON VEGETARIAN DIET

Both the cross sectional and experimental data suggest that a non vegetarian diets have a hypertensive effect.

h. SODIUM (SALT)

Sodium consumed in excess make a significant contribution to the causes of many diseases especiallyfor those who suffer from hypertension. Drinking water can contribute to one's total sodium intake by 10% (Hoffman 1989). According to Dahl (1981) approximately 25% of all individuals exposed to a high carbhohydrate, and high salt diet will have noticebly higher blood pressure. Excessive sodium is thought to increase blood pressure by increasing total body sodium which leads to an increased extra cellular fluid volume. Some individuals kidneys cannot effectively handle the increased fluid load and blood pressure rises to enhance fluid excretion and prevent oedema.

i. POTASSIUM

Addition of potassium reduces blood pressure (MaC Gregor et al. 1982) Potassium defeciency sometimes brings hypertension.

j. SERUM CHOLESTEROL

The association of serum cholestrol level with the incidence of intracranial hemorrhage was apparent among men with diastolic blood pressure $\geq$ 90mm Hg and was not noted among men with diastolic blood pressure $<$ 90mm Hg. Salonen (1983) found a positive correlation between the consumption of saturated fats and blood pressure in 8500 middle aged individuals aged 30-64 years.

k. MAGNESIUM

Total magnesium intake was strongly and inversely associated with systolic blood pressure. Patients who were fed with moderately or severely defecient diet in magnesium showed a significant increase in arterial blood pressure.

l. CALCIUM

Low dietary calcium intake is cross-sectionally associated with higher prevalence of hypertension. In women low calcium intake was found to add to the risk of cerebrovascular disease in population in Pittsburgh (Yamomoto 1985)

C. EFFECT OF DIFFERENT FOODS ON HYPERTENSION

A trial of non drug modalities is recommended to treat hypertension.

SODIUM

Low sodium diet may be beneficial. In a resistant case the diet has to be very low in Sodium. Ingestion of food stuffs or drugs with a sodium retaining activity e.g liquorice, tends to produce hypertension. Foods low in Sodium such as cereals like wheat, rice, bajra, jower, fresh fruits, fats, oils, butter, cream (unsalted), nuts (unsalted), honey, sugar, brinjals, cabbage, cauliflower, cucumber, beans, lettuce, tomato, peas, onion and vinegar can be added. Foods high in Sodium such as biscuits, meat, extracts, milk, salted nuts, vegetable beetroot, carrot, and any salted foods rich in Sodium must be avoided.

VEGETARIAN DIETS

Vegetarian diets have more hypotensive effect than non vegetarian diets, the food patterns of vegetarians suggest that in addition to avoiding meat and animal products, apart from eggs and milk products, long term vegetarians also eat more whole grain, cereals, fruits, nuts, legumes and vegetables. As a consequence to

the dietary differences between vegetarian and non vegetarian there are also many nutrient intake which differ. Vegetarians have higher intake of fibre, thiamine, vitamin C, Iron and less of Vitamin B12.

Weight reduction seems also to have a favourable influence on the hypertensive heart by decreasing left ventricular mass. In the 1986 guidelines for the treatment of hypertension ... WHO recommends non-pharmacological treatment for mildly hypertensive and says that the cornerstone of this therapy is weight reduction. So, an obese person must consume a low calorie diet, and avoid foods very high in calories as saturated fats, potatoes and all Indian sweet preparations.

DIETARY FAT

Polyunsaturated fatty acids tend to reduce the blood pressure in hypertensive patients. Saturated fatty acids and fats as butter, margarine, ghee, cheese, castor oil, coconut oil and mayonnaises must be completely avoided from the diet. On the other hand these fats must be replaced by poly unsaturated fatty acids as sunflower oil, safflower oil, corn oil and soya oil. A different type of polyunsaturated fat to that in oil seeds is derived from fish. Eicosapentaenoic acid is one of the common fatty acids in fish that have a mild hypotensive effect. It is recommended that saturated fatty acids should contribute to no more than 10% to the total energy

intake implying for many countries that only 20-30% of total dietary energy should be provided by fats.

DIETARY FIBRE

Many surveys which show that people in developing countries exhibit little rise in blood pressure with age and a low incidence of hypertension. These populations consume foods which are rich in fibre. Fibre rich diet must be included in the diet for hypertensives as wheat bran, whole grains, fresh fruits, vegetables such as plaintain stem and all varieties of green leafy vegetables except spinach.

SALT

Much work has done about role of salt in hypertension. People living in modern industrialised societies consume high salt. Salt should therefore not be added during cooking as well as at the table. Processed foods/pickles, ketchups, potato crisps, papads, jam, jellies which have sodium benzoate as a preservative must be avoided.

Apart from the fact of the dietary control of hypertension certain other factors play a direct role in the lowering of hypertension. Alcohol consumptions, and smoking must be minimised

or completely avoided. Various studies have proved the beneficial effects of the ceasation of hypertension by avoiding alcohol.

Yoga, transcendental meditation, hypnosis, progressive muscle relaxation are some methods available for good relation and tend to decrease the diastolic pressure. Patel et al. (1981) could achieve good result in mild hypertensive on biofeed back aided relaxation programme for 8 weeks. Thus, using non-pharamalogical means it is possible to reduce blood pressure in patients with mild and moderate hypertension.

Experimental Procedure

III EXPERIMENTAL PROCEDURE

This research study 'dietary intake of hypertensive patients and the effect of four foods that lower hypertension' consisted of the following steps:

A. Study of Hypertenisve subjects

1. Selection of subjects
2. Choice of Methodology and formulation of schedules
3. Assessment of the socio economic status of the subjects.
4. Past dietary pattern and practises of the subjects.

B. Study of Hypotensive foods in terms of :

1. Blood pressure picture
2. Serum cholesterol
3. Sodium intake

A. Study of hypertensive subjects

1. Selection of the subjects

The subjects for the study were selected from Coimbatore city from hospitals in R.S.Puram area with a help of a physician. Out of the 200 subjects surveyed, twenty subjects were further selected as sub samples, of this 10 were males and 10 females.

2. Choice of Methodology and formulation of schedules

Since most of the subjects selected were illeterates the oral interview method was followed to elicit information regarding the socio economic status, past dietary pattern and practises of the subjects,

other risk factors associated with hypertension, and determination of the nutrient intake of subjects.

3. Assessment of the Socio Economic status of the subjects:

The interview schedule given in Appendix I used to collect information on socio-economic and dietary patterns of the subjects consisted questions to collect information about the type of family, age, height, weight and source of income, monthly income and their educational status.

4. Past dietary pattern and practises of the subjects:

Past dietary pattern and practises of the subjects were collected on the basis of the hours of sleep, stress of profession, meal pattern, consumption of non vegetarian foods by non vegetarian subjects, addition of baking soda, in their diet, beverages, type of oil, meal outside home, and the amount of food consumed per day and amount of water consumption.

Determination of food and nutrient in take of the subjects was determined by weightment food survey for three consecutive days. Information on the consumption of alcohol, cigarettes, and risk factors as renal disorders and heredity were also collected.

B. Study of Hypotensive foods in terms of:

1. Blood pressure picture
2. Serum cholesterol
3. Sodium intake

Four hypertenisve lowering foods namely plaintain stem, cauliflower, ridge gourd and saf-flower oil were recommended to the hypertensive subjects. All foods that raise hypertension are eliminated from the diet. The recommendation was made through leaflets given in Appendix II. For those patients who were obese another leaflet was given in Appendix III was given which helped to reduce the weight, but keeping the nutrient intake in adequate amounts that will be required by the patients.

While planning and recommending diets for the subjects, the cost of foods, normal food habits, seasonal availability of foods, conveniences of preparation and likes and dislikes of the subjects were taken into account. This was done for the selected twenty patients. A well balanced diet should contain all the nutrients in correct proportions and in adequate amounts (Gopalan et al 1984).

1. Blood Pressure Picture

According to Sheth (1988) hypertension in classified on the basis of diastolic pressure. Pressures between 95-104 mm Hg constitute mild, between 105-114 mm Hg moderate hypertension and over 115 mg severe hypertension. Blood pressure of the subjects were determined by the sphygomanometer once or twice daily according to the patients condition at the sitting, standing and lying down positions using standardised procedure as given by the British Hypertension Society (1985) by a physician.

2. Serum cholesterol

Sainani (1983) indicates that a higher cholesterol level in blood indicates a higher blood pressure, hence the necessity of the estimation of serum cholesterol level. The serum cholesterol level of the subjects were estimated by Zak's method (Appendix IV).

3. Sodium Intake

Sodium intake of the selected subjects were calculated before and after the study. Albert (1988) reports that increased sodium intake tends to increase the blood pressure level, and that reduction of sodium in the diet is an effective step towards lowering hypertension.

Results and Discussion

IV RESULTS AND DISCUSSION

The results of the present study entitled "dietary intake of hypertensive patients and the effect of four foods that lower hypertension are discussed under the following heads:

A. Socio economic background of the selected subjects

B. Dietary pattern of the selected subjects

C. Nutritional status of the subjects in terms of height and weight

D. Blood pressure lowering four foods recommended for the study

E. Mean food and nutrient intake by the selected subjects during the experimental period.

F. Blood pressure and serum cholesterol levels before and after the experimental period.

G. Sodium intake of the subjects,

A. Socio Economic background of the selected subjects

Out of the 200 subjects twenty were selected to carry out the study. The socio economic details of the selected subjects with reference to the source of income, monthly income, size of the family, whether vegetarian or non vegetarian are given in Table I.

TABLE I

SOCIO ECONOMIC BACKGROUND OF THE SUBJECTS

S.No	Details	Number of Males	Number of Females
1.	Source of Income		
	Business	6	4
	Rent	-	1
	Office	2	1
	Profession	-	1
	Field	1	2
	Others	1	1
2.	Monthly Income		
	below 500	-	-
	600-700	1	-
	800	2	3
	900	2	1
	1000	2	2
	above 2000	3	4
3.	Size of the family		
	1 - 3	7	4
	4 - 6	2	5
	Above 6	1	1
4.	Vegetarian	5	3
	Non-Vegetarian	5	7

From Table I it is seen that out of the 20 subjects surveyed for the study 10 were males and 10 females.

Out of the 10 males selected 6 of them had business as their source of income 2 from rent, 1 from office and 1 obtianed income from other sources of income. Of the 10 females 4 obtained income from business, 1 from rent, 1 from office, 1 from profession, 2 from field, and 1 from other sources of income.

The monthly income ranged from below 500 to Rs.2000 and above. Of the 10 males, 1 had income between Rs 600-700, 2 Rs.800, 2 obtianed Rs.900, 2 Rs.1000 and 3 above Rs.2000. Three out of the 10 females obtained Rs.800, 1 about Rs.900, 2 obtained Rs.1000 and 4 of them received above Rs.200.

Among the subjects surveyed in males 7 subjects had a family size ranging from 1-3, 2 between 4-6, 1 above 6 members, out of the 10 females 4 were from the family consisting of 1-3 members, 5 between 4-6 and 1 belonged to a family above 6 members.

Five of males and 3 females were vegetarians and 5 males and 7 females were non vegetarians.

B. Dietary pattern of the selected subjects

1. Meal pattern

The daily meal pattern of the selected subjects is that for breakfast items like dosai, iddli, uppuma, chappathi and coffee was consumed. For mid morning coffee was taken and for lunch the items were rice, sambar, vegetable poriyal, a greens preparations and buttermilk. For evening it was coffee or tea. For dinner the subjects consumed either chappathi, iddli, dosai or rice.

TABLE II

CONSUMPTION OF HIGH SODIUM CONTAINING FOODS

S.No	Details of food	Number of Males	Number of Females
1.	Papads	9	9
	Chutney	7	9
	Pickle	8	8
	Preserved food	-	1
	Smoked food	-	1
2.	Baking soda consumption subjects who consume	6	6
	Subjects who do not	4	4
3.	Beverages		
	Coffee	10	8
	Tea	1	2
	Other Beverages	3	3
4.	Subjects who consume meals outside home	2	2
	Subjects who do not	8	8

As per the Table II out of the 10 males 9 consume papads, 7 subjects consume chutney and 8 consume pickles. Of the 10 females 9 consume papads 9 consume chutney 8 pickle and 1 subject consume preserved foods and 1 smoked food.

Out of the 20 subjects 6 males and 6 females add baking soda in their diet, and 4 males and 4 females do not add baking soda in their diet.

Ten males consume coffee, 1 consume tea and 3 other beverages. Eight females consume coffee, 2 consume tea and 3 other beverages.

Of the 20 subjects 2 males and 2 females consume meals outside home and 8 males and 8 females do not consume meals outside home.

TABLE III

CONSUMPTION OF WATER AND OIL BY SUBJECTS

S.NO	Details of Food	Number of Males	Number of Females
1.	Oil		
	Groundnut	3	3
	Gingelly	7	3
	Castor	-	-
	Ghee	-	1
	Coconut	-	-
	Sun flower	1	2
	Safflower	1	1
	Refined oil	-	2
2.	Water consumption		
	Less than 500 ml	-	-
	500 - 1000ml	2	2
	1000 - 1500 ml	3	4
	1500 - 2000 ml	5	4
	2500 ml and more	-	-

From Table III it is revealed that three of the males consume groundnut oil, 7 consume gingelly oil, 1 sunflower oil, and 1 safflower oil, out of the 10 females 3 consume groundnut oil, 1 gingelly oil, 1

1 consume ghee, 2 sunflower oil, and 1 safflower oil and 2 consume refined oil.

Out of the 10 male subjects 2 of them consume 500-1000 ml of water, 3 consume 1000-1500 ml, and 5 from 1500-2000ml. Of the 10 females 2 consume between 500-1000ml, 4 consume 1000-1500ml, 4 consume between 1500-2000ml of water.

2. Mean Home Food Intake of the selected subjects

From the weighment survey conducted the mean foods consumed by the subjects are prescribed in Table IV and Figure 1. Individual values are presented in Appendix V.

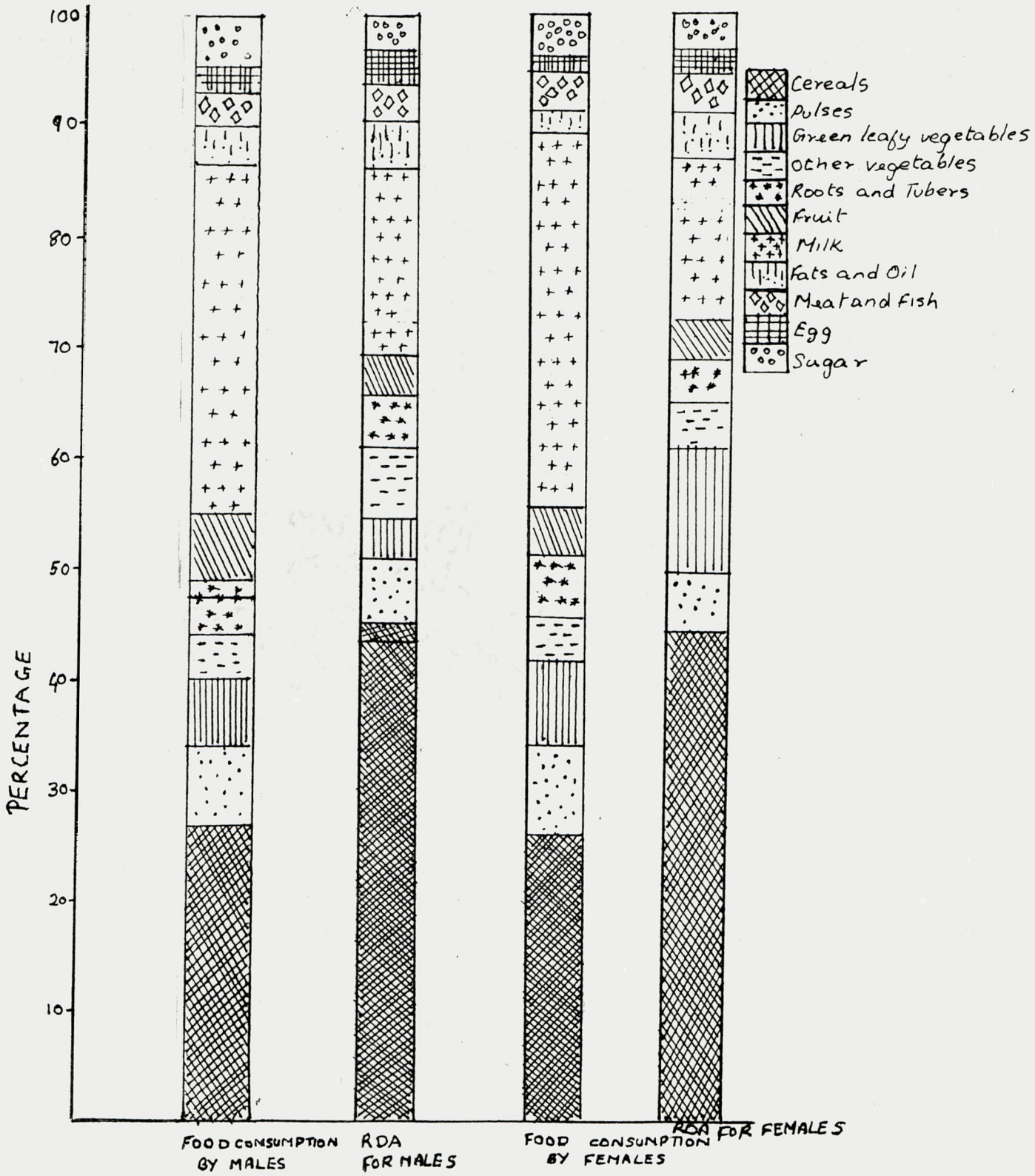
TABLE IV

MEAN FOOD CONSUMPTION OF MALE AND FEMALE SUBJECTS FROM HOME DIETS COMPARED WITH RECOMMENDED DIETARY ALLOWANCES

Foods	Amount consumed by Males (g)	RDA (g)	% difference	Amount consumed Females (g)	RDA (g)	% difference
Cereals	204	520	-61	210	440	-52
Pulses	51.3	50	+3	51.3	45	+14
Green leafy vegetable	53.2	40	+25	62.9	100	+37
Other vegetables	32.3	70	-54	31.1	40	-25
Roots and Tubers	36.3	60	-40	37	50	-26
Fruits	39.5	30	+32	42.8	30	+43
Milk	265	200	+33	255	150	+70
Fats and oils	18.5	45	-59	18	25	-28
Meat & Fish	34.8	30	+16	33	30	-10
Egg	9.3	30	-69	9.1	30	-69
Sugar & Jaggery	40	35	+42	34	20	-70

Figure 1

AN FOOD CONSUMPTION OF MALE AND FEMALE SUBJECTS FROM HOME DIETS COMPARED WITH RDA (IN PERCENTAGE)



The male subjects with moderate activity were unable to consume the recommended amount of meals and the amount consumed was less than the recommended allowance by 61 percent. Pulses was consumed 3 percent more than the recommended allowances and green leafy vegetables 25 percent more than the recommended allowance. Other vegetables was consumed less than 54 percent and 40 percent less of roots and tuber. Fruits was consumed 30 percent more and milk 33 percent more and fats and oils was consumed less than 59 percent from the recommmended allowances. Meat and fish was consumed more than 16 percent of the recommended allowance, egg was consumed 69 percent less and sugar and jaggery was consumed more than 42 percent.

The female subjects with moderate activity were unable to consume the recommended amount of cereals and the amount consumed was less than 52 percent of the normal recommended allowance. Pulses was consumed 14 percent more; green leafy vegetables 37 percent more, other vegetables 25 percent less, roots and tubers 26 percent less, fruits 43 percent more milk 70 percent more, fats and oils 28 percent less, and sugar and jaggery was consumed 70 percent less than the normal recommended allowance.

TABLE V and Figure .2 shows the mean nutrient intake of selected male subjects from Home diet. Individual values are given in Appendix VI.

TABLE V

MEAN NUTRIENT$ INTAKE OF SELECTED MALE SUBJECTS FROM HOME DIETS

Details	Energy K cal	Carbho hydrate (g)	Fat g	Protein g	Calcium g	Iron mg	Retinol µg	Carotene µg	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
Mean	1572	261.9	36.69	55.28	0.96	30.36	478.05	2117.85	2.85	2.26	11.31	3.65	97.96
RDA	2800	250	-	55	0.5	24	750	3000	1.4	1.7	19	-	40
Percentage difference	-44	+5	-	+0.5	+48	-27	-36	-29	+0.01	+33	-41	-	+58

FROM HOME DIETS

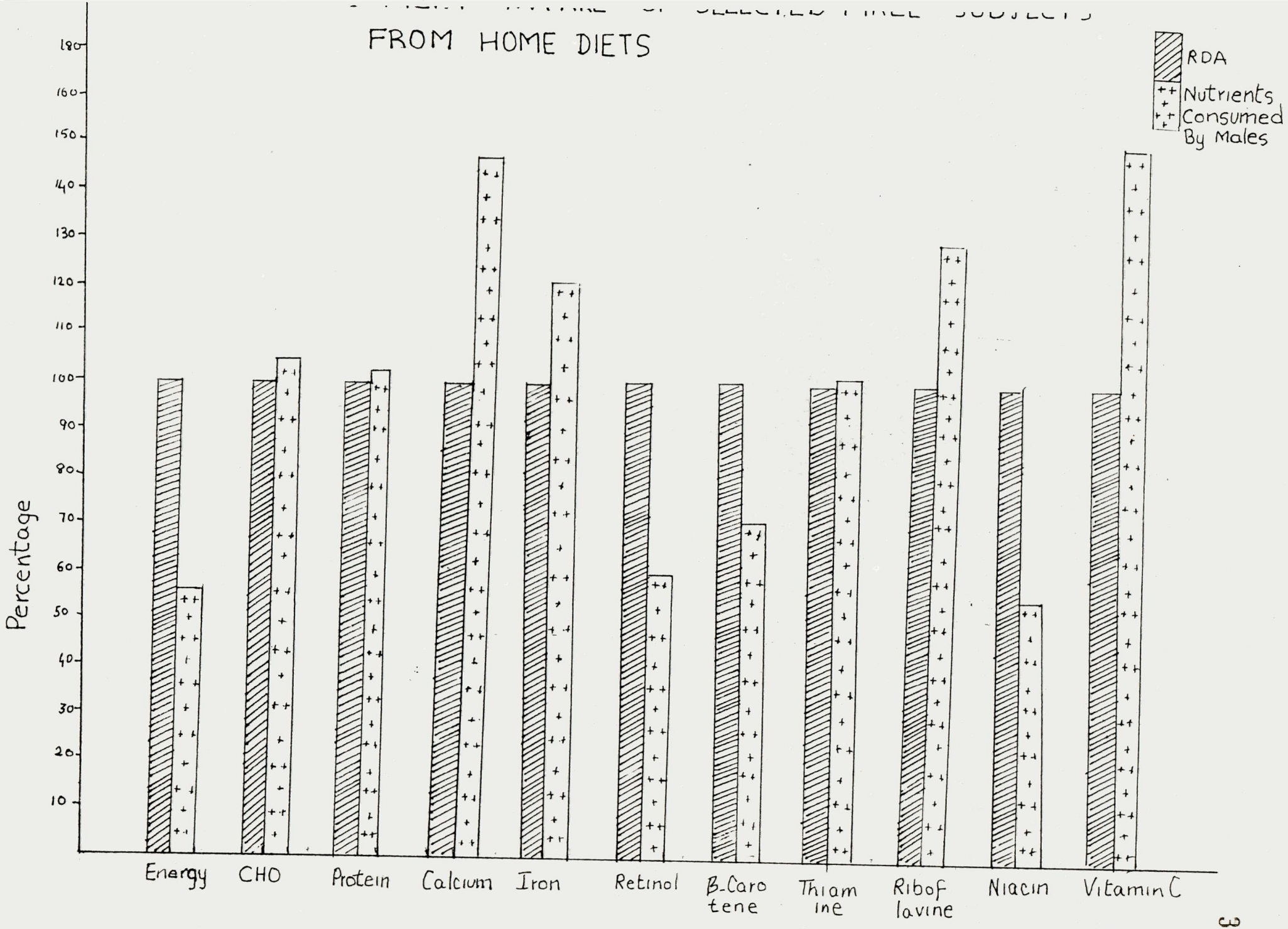


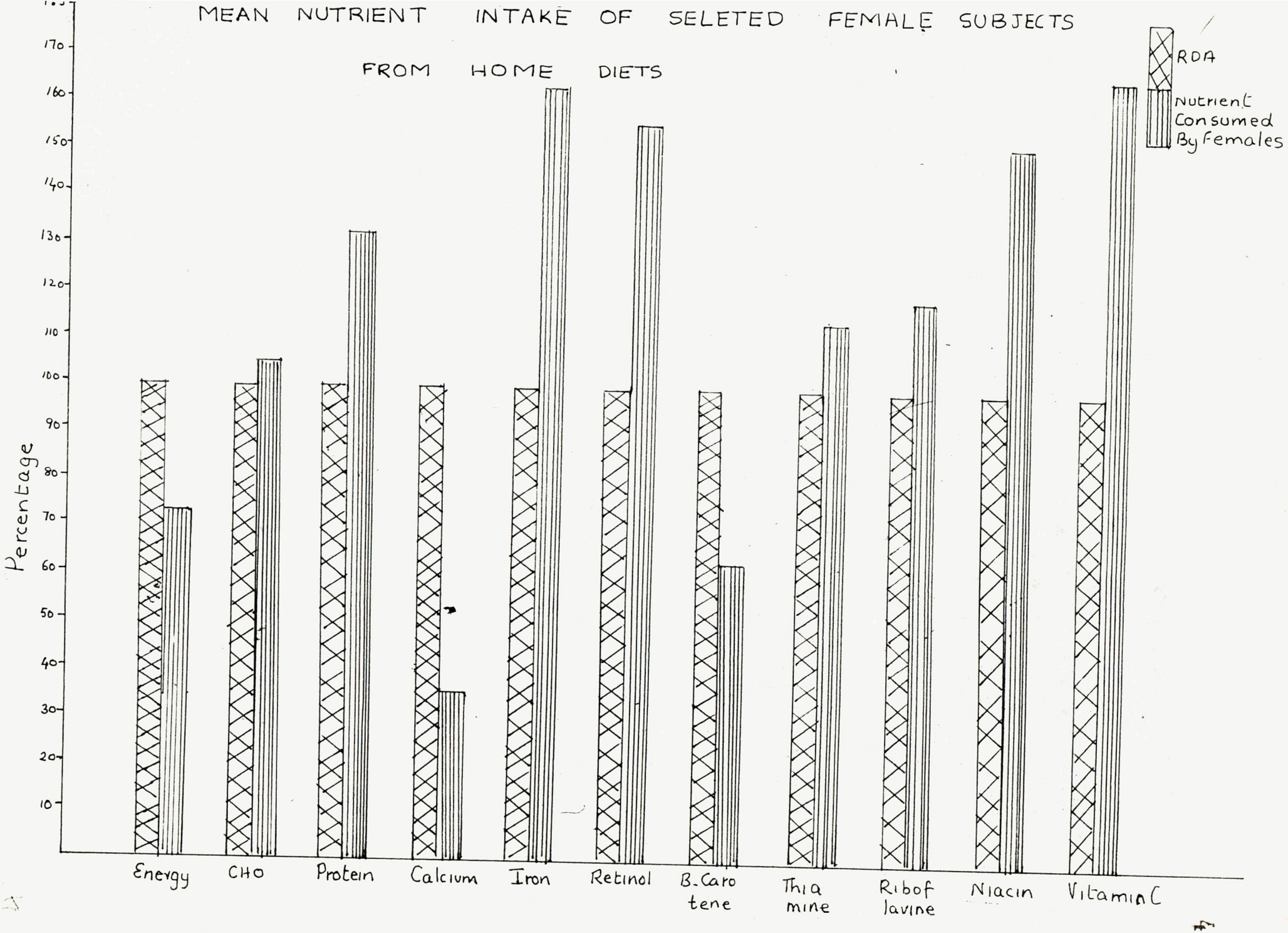
Table V which shows the nutrients obtained from the home diet of the selected male subjects it is clear that the energy intake was less due to the deficit of roots and tubers, cereals and fats and oils. Energy intake was 44 percent less than the recommended allowance, Retinol 36 percent less; Carotene 29 percent less, niacin 41 percent less and the intake of carbohydrate was 5 percent more than the recommended allowance, protein 0.5 percent more, Calcium 48 percent more, Riboflavine 33 percent more and Vitamin C 58 percent more than the recommended nutrient allowances.

Table VI and figure 3 present the mean nutrient intake of the selected female subjects resulting from their home diet consumption. Individual values are given in Appendix VII.

TABLE VI

MEAN NUTRIENT INTAKE OF SELECTED FEMALE SUBJECTS FROM HOME DIETS

Details	Energy K cal	Carbo hydrate g	Fat g	Protein g	Calcium g	Iron mg	Retinol µg	Carotene µg	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
Mean	1618	258.5	31.4	60.1	0.81	82.16	460.9	3573	1.3	1.32	32.9	3.33	139.8
RDA	2200	250	-	45	0.4 0.5	32	750	3000	1.1	1.3	15	-	40
Percentage difference	$^{-}$26	$^{+}$3.4	-	$^{+}$334	$^{+}$63	$^{+}$61	$^{-}$39	$^{+}$16	$^{+}$18	$^{+}$2	$^{+}$54	-	$^{+}$71


MEAN NUTRIENT INTAKE OF SELETED FEMALE SUBJECTS
FROM HOME DIETS
RDA
Nutrient Consumed By Females
Percentage
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
Energy
CHO
Protein
Calcium
Iron
Retinol
B-Caro tene
Thia mine
Ribof lavine
Niacin
Vitamin C

From Table VI it shows the nutrients obtained from the home diet of the selected female subjects it is clear that the subjects consumed a diet with most of the nutrients above the recommended allowance. Calcium, iron, Carotene, Thiamine and riboflavine, niacin and vitamin C were all above the normal recommended allowance due to the adequate consumption of vegetables and fruits. The energy intake of the subjects were 26 percent less and retinol intake was 39 percent less than the normal recommended allowance.

C. Nutritional status of the subjects:

All the 20 subjects selected for the study were free from diseases or from obvious defeciency signs. Their age, height and weight are presented in Table VII.

TABLE VII

AGE, HEIGHT AND WEIGHT OF THE SELECTED MALE AND FEMALE SUBJECTS

S.No	Details	Number of of Males	Number of Females
1.	Age of the patients		
	30.1 - 40 years	-	1
	40.1 - 50 years	4	1
	50.1 - 60 years	3	3
	60.1 - 70 years	3	5
	70.1 - 80 years	-	-
2.	Height of the Patients		
	120.1 - 140 cms	-	4
	140.1 - 160 cms	3	5
	160.1 - 180 cms	6	4
	180.1 - 200 cms	1	-
3.	Weight of the Patients		
	40.1 - 50 Kg	-	1
	50.1 - 60 kg	1	3
	60.1 - 70 kg	4	3
	70.1 - 80 kg	3	3
	80.1 - 90 kg	2	-

Out of the 10 male subjects selected 4 of them were between the age group of 40.1 -50 years, 3 between 50.1 -60 years, and 3 between 60.1-70 years. Of the 10 female subjects 1 was between 30.1-40 years and 1 between 40.1-50 years, 3 between 50.1 - 60 years, and 5 between 60.1-70 years.

Three males were between 140.1 -160 cms, and 6 between 160.1 -180 cms, and 1 between 180.1-200cms. Of the 10 females one of the subject was between 120.1-140cms. 5 between 140.1-160cms and 4 between 160.1-180cm. As per the National Institute of Nutrition (1980) the average height of subejcts was less than the national average.

Out of the 10 females subjects 1 was between 50.1 -60 kg, 4 between 60.1-70 kg; 3 between 70.1 - 80 kg and 2 between 80.1 -90 kg. Out of the 10 females, 1 was between 40.1 - 50 kg, 3 between 50.1 - 60 Kg 3 between 60.1 - 70 kg and 3 of the subjects between 70.1 - 80 kilo grams. The weight of half the subjects were more than the national average.

TABLE VIII

DEGREE OF BLOOD PRESSURE OF SELECTED SUBJECTS

S,NO	Blood pressure	Number of Males	Number of Females
1.	Mild (95-104mm Kg)	9	7
2.	Moderate (105-114mm Hg)	1	2
3.	Moderately severe (115-124 mm Hg)	-	1

Sainani (1987) says that mild hypertensives form 75% of the total hypertensive population.

Of the selected male subjects 9 suffered from mild hypertension, 1 from moderate and of the females 7 suffered from mild, hypertension 2 from moderate and 1 from moderately severe hypertension.

D. Blood Pressure lowering four foods recommended for the study

Four foods were recommended to the hypertensive subjects which has the capacity to lower hypertension. They were

a. Plaintain stem

b. Cauliflower

c. Ridge gourd

d. Saf-flower oil

a. Plaintain stem

Ian (1988) reported that the factor of the inclusion of fibre in the diet promoted a significant decrease in the blood pressure of the experimental subjects. Plaintain stem is not only rich in fibre but also has a diluting effect of blood and thereby decreases the blood pressure, and it was recommended for the patients.

b. Cauliflower

Cauliflower is a food that is very low in sodium content and hence consumption of cauliflower is recommended for the hypertensive patients.

C. Ridge gourd

Ridge gourd was also recommended for the hypertensive patients, it is very low in sodium content.

D. Saf-flower oil

Kafatos et al (1988) reported that hyper cholestrolemia was a risk factor of hyper tension and therefore the inclusion of polyunsaturated fatty acids have been implicated as being an important factor in the treatment of hypertension. Therefore linoleic acid present in saf-flower oil is unsaturated and hence tends to reduce the serum cholestrol levels and thereby reduces the blood pressure.

In addition to the main foods the following points were also included in the food recommended list.

1. Avoidance of sodium rich foods such as salted nuts, papads, jams, jellies, vegetables such as beetroot, carrot, radish, dried fruits as raisins, sultanas and figs. Carbonated beverages, potato chips and popcorn were recommended to be avoided.

2. Weight reduction was recommended to those subject who were obese.

3. Saturated fatty acids such as in coconut oil, ghee, butter were to be avoided, and a vegetarian diet was considered the best for hypertensive subjects.

E. Mean food and nutrient Intake by the selected subjects during the experimental period

1. Mean Food Intake by the selected subjects during the experimental period

During the experimental period the subjects were advised to consume the foods recommended which tends to decrease hypertension. Details of food consumption was recorded carefully for 24 hours for each subject.

The mean food intake of the subjects during the experimental period is presented in Table IX figure 4 and individual values are given in Appendix VIII.

TABLE IX

MEAN FOOD INTAKE BY SELECTED MALE AND FEMALE SUBJECTS DURING THE EXPERIMENTAL PERIOD

Foods	Males			Females		
	Amount of foods (g)	RDA (g)	Percentage difference	Amount of foods (g)	RDA (g)	Percentage difference
Cereals	300	520	-42	240	440	-45
Pulses	51	50	+2	47	45	+4
Green leafy vegetables	20	40	-20	45	100	-55
Other vegetables	90	70	+120	75	40	+35
Roots & Tuber	35	60	-42	30	50	-40
Fruits	38	30	+21	40	30	+25
Milk	225	200	+11	200	150	+25
Fats & Oils	20	45	-56	20	25	-20
Meat & Fish	25	30	-7	20	30	-33
Egg	-	30	0	-	30	-
Sugar & Jaggery	40	30	+25	30	20	+33

The male subjects did not consume the recommended amount of cereals it was 42 percent deficit from RDA but the amount consumed was more than before experimental. The amount of pulses consumed was 2 percent more than RDA, but remained same before and after the experimental period. The green leafy vegetables were less than the RDA. Other vegetables was more by 20 percent, but more in the experimental period

Roots & Tubers was 42 percent lower than RDA, by ICMR (1984) fruits 21 percent more, milk 11 percent more, fats & oil 56 percent less; meat 7 percent less and sugar & jaggery 25 percent more than the RDA. The amount of roots & tubers, fruits, milk, fats & oil, meat and egg were all found to be decreased during the experimental period, where as it was more before the experimental period.

In the female subjects during the experimental period the amount of cereals was 45 percent less than the RDA, by ICMR (1984) 4 percent more, green leafy vegetables 55 percent less, other vegetables 35 percent more roots & tubers 40 percent less, fruits 25 percent more milk 25 percent more, fats 20 percent less, meat 33 percent less, and sugar & jaggery 33 percent or more.

The amount of milk, and other vegetables consumed was found to be more and pulses remained the same during the experimental period. Roots & tuber, fruits, milk, fats & oil, Meat & egg consumed were all found to be decreased in amount during the experimental period than before the period.

2. Mean Nutrient Intake by the subjects during the experimental period

During the experimental period the subjects were recommended to consume the foods which lower hypertension. Details of the consumption was recorded carefully for each subject during the meal time of one day. The mean food intake of selected male subjects with recommended allowance is presented in Table X figure 5 with individual values in Appendix IX..

TABLE X

MEAN NUTRIENT CONSUMPTION OF THE SELECTED MALE SUBJECTS DURING THE EXPERIMENTAL PERIOD

etails	Energy K cal	Carbho hydrate	Fat	Protein	Calcium	Iron	Retinol	Carotene	Thiamine	Ribo flavine	Niacin	Sodium	Vitamin C
	g	g	g	g	g	mg	µg	µg	mg	mg	mg	g	mg
ean	1800	223.4	22	56.2	1.21	26.2	525.13	2235.2	1.87	2.32	12.6	1.74	83.2
DA	2800	250 ~		55	0.4-0.5	24	750	3000	1.4	1.7	19		40
ercentage fference	-36	-11	-	+2	+50	+9	-30	-25	+25	+27	+34		+52

Figure.4

MEAN FOOD INTAKE BY SELECTED MALE AND FEMALE SUBJECTS DURING THE EXPERIMENTAL PERIOD

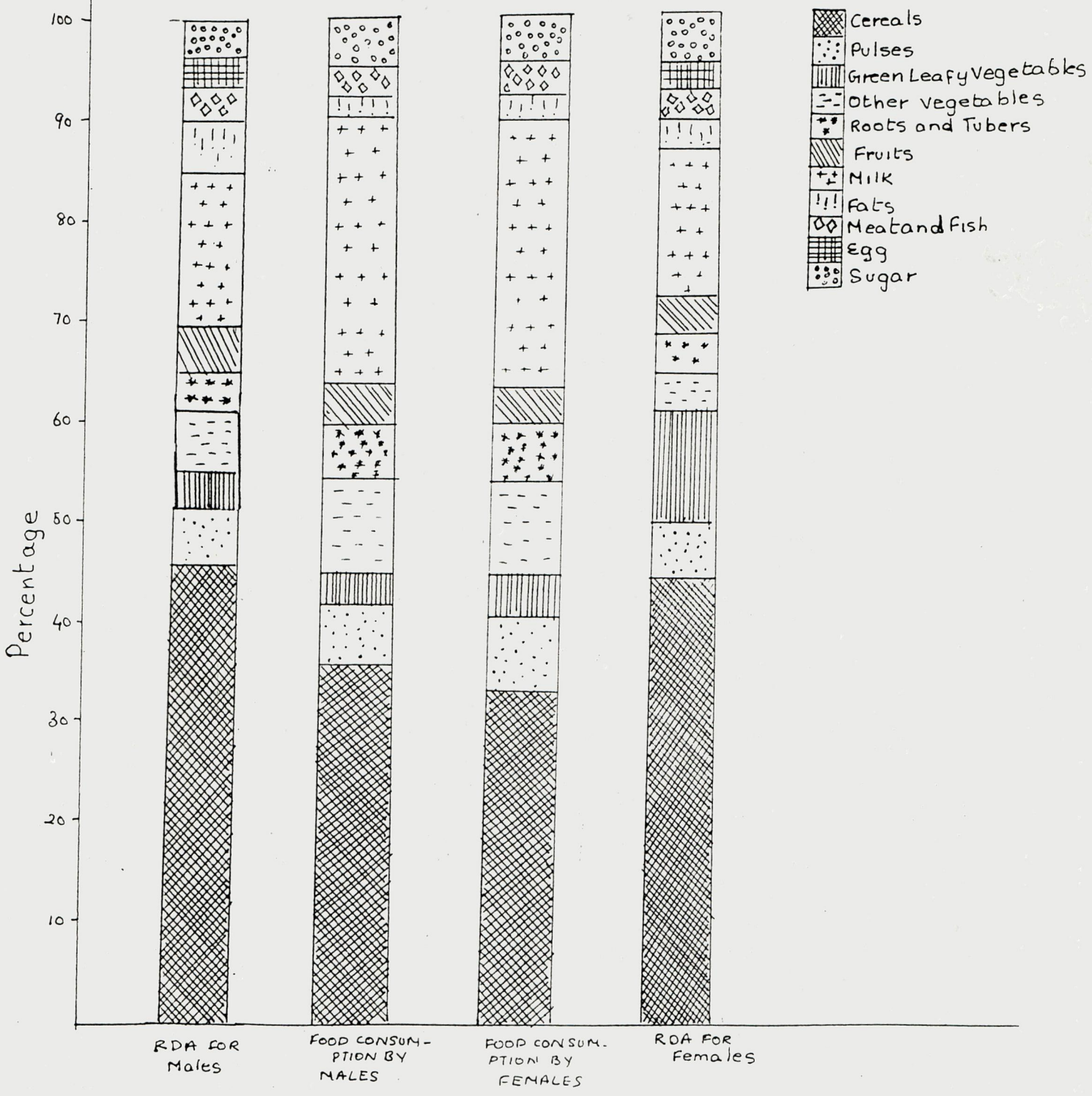
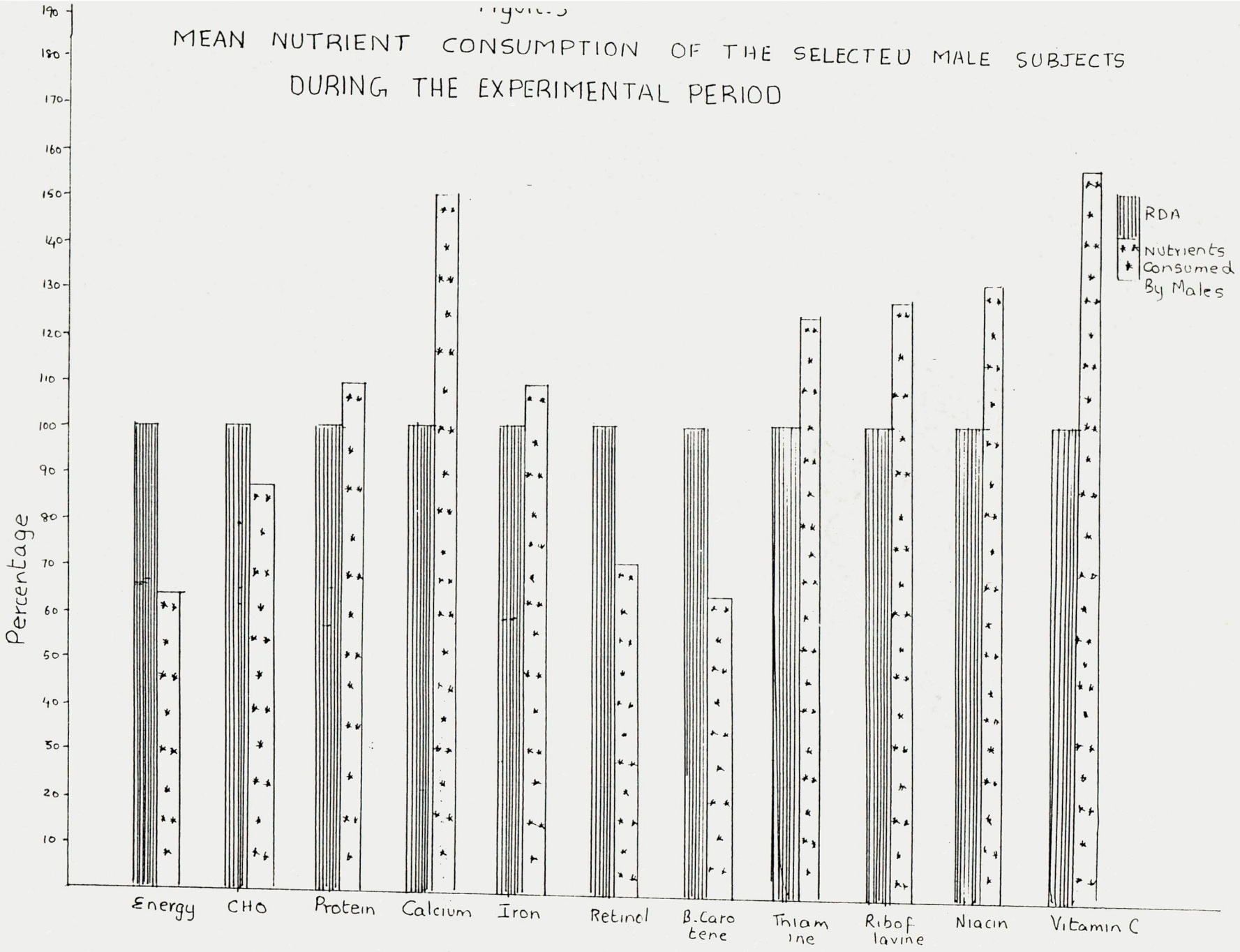


Figure 3

MEAN NUTRIENT CONSUMPTION OF THE SELECTED MALE SUBJECTS DURING THE EXPERIMENTAL PERIOD



The mean nutrients supplied by the diet during the experimental period was slightly different when compared to the diet intake before the experimental period. The values of Energy, Calcium, retinol, B carotene, thiamine, riboflavine and niacin was more during the experimental period, the carbhohydrate, and Vitamin C was less and the protein and iron value remained the same.

On comparison with the recommended allowance during the experimental period, the Energy intake was deficit by 36 percent, Carbhohydrate was 11 percent less, protein 2 percent more, Calcium 50 percent more, Iron 9 percent more, retinol 30 percent less, B carotene 25 percent less, thiamine 25 percent more, less than the recommended dietary allowance.

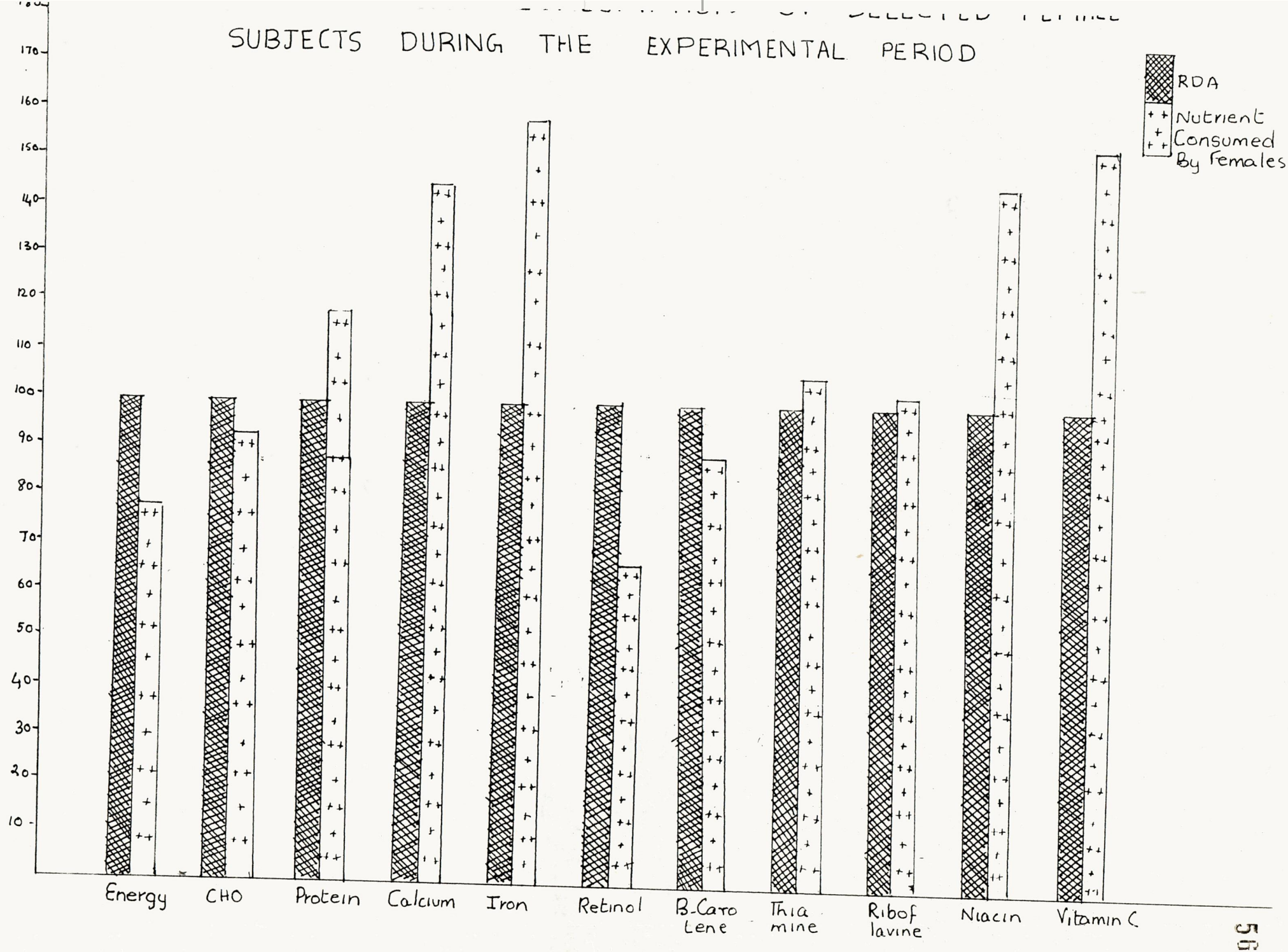
Table XI and figure 6 indicates the mean nutrient consumption by female subjects during the experimental period individual values given in Appendix X.

TABLE XI

MEAN NUTRIENT CONSUMPTION OF THE SELECTED FEMALE SUBJECTS DURING THE EXPERIMENTAL PERIOD

tails	Energy k cal	Carbho hydrate g	Fat g	Protein g	Calcium g	Iron mg	Retinol µg	Carotene µg	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
ean	1729	236.2	18	55	0.92	75	502	2835.2	1.2	1.4	28.2	1.22	103.6
DA	2200	250	-	45	0.4 - 0.5	32	750	3000	1.1	1.3	1.5	-	40
ercentage ifference	-21	-6	-	+18	+46	+57	-33	-6	+8	+7	+47		+61

SUBJECTS DURING THE EXPERIMENTAL PERIOD



From Table XI it is evident certain nutrients are less when compared with the recommended allowance, these nutrients are energy which is deficit by 21 percent, Carbhohydrate by 6 percent, retinol by 33 percent carotene by 6 percent.

The intake of protein, calcium, iron, thiamine, riboflavine, niacin and vitamin C was found to be more than the recommended dietary allowance.

In comparison of this nutrient intake with the nutrient intake before the experimental period, it was found that the intake of energy, calcium, retinol, carotene, and riboflavine was more in the experimental period, and the intake of iron, thiamine and Vitamin C was less when compared.

F. Blood pressure and Serum Cholesterol levels before and after the experimental period

a. Blood Pressure level:

According to Friedrich (1990) hypertension is arbitrarily defined as a systolic pressure equal to or greater than 160 mm Hg and/or a diastolic pressure equal to or greater than 95mm Hg during most of the pressure readings. Table XII presents the blood pressure readings before and after the experimental period, and the percentage of difference between the two values.

TABLE XII

BLOOD PRESSURE LEVELS BEFORE AND AFTER EXPERIMENTAL PERIOD OF MALE SUBJECTS

Subjects	Blood pressure before the experimental period	Blood pressure after the experimental period	Percentage difference
M_1	190/100	130/80	32/20
M_2	150/90	120/80	20/11
M_3	160/100	120/86	25/14
M_4	140/100	120/78	14/22
M_5	160/100	130/84	19/15
M_6	140/110	130/84	7/15
M_7	140/90	120/78	14/13
M_8	140/100	120/80	14/11
M_9	150/100	128/80	15/11
M_{10}	160/100	130/78	19/22

The blood pressure for the selected male subject M_1 the percentage difference was between 32-20 percent, M_2 20 -11 percent. M_3 25-14 percent, M_4 14-22 percent; M_5 19-16 percent; M_6 7-15 percent, M_7 14-13 percent, M_8 14-18 percent, and the subject M_{10} had a difference of blood pressure of 19-22 percent after the experimental period. Similar reports were reported by Shah et al (1984) in his experiments with non vegetarian foods and unsaturated oils on hypertensive subjects.

Thus the Table XII gives a clear picture that there was a definite decrease in blood pressure in 45 days due to the consumption of the recommended foods by the selected male subject for the study.

Table XIII presents the blood pressure levels before and after the experimental period and the percentage difference which occured before and after the experimental period.

TABLE XIII

BLOOD PRESSURE LEVELS OF FEMALE SUBJECTS BEFORE AND AFTER THE EXPERIMENTAL PERIOD

Subjects	Blood pressure before the experimental period	Blood pressure after the experimental period	Percentage difference
F_1	160/96	130/90	19/6
F_2	160/90	130/80	19/11
F_3	190/90	130/86	32/4
F_4	160/90	130/80	19/11
F_5	140/100	130/84	7/15
F_6	150/100	136/82	9/18
F_7	180/90	130/82	27/8
F_8	180/100	140/80	22/20
F_9	180/110	146/90	19/18
F_{10}	190/90	140/80	26/11

The blood pressure of female subjects before and after the experimental period in Table XIII shows a clear picture of a moderate degree of decrease in blood pressure.

The subject F_1 had a percentage difference of 19-6 percent subject F_2 19-11 percent, F_3 32-4 percent, F_4 19-11 percent, F_5 7-15 percent, F_6 9-18 percent, F_8 22-20 percent, F_9 19-18 percent and the subject F_{10} had a percentage difference of 26-11 percent.

Table XIV and figure 7 presents the serum cholestrol levels before and after the experimental period.

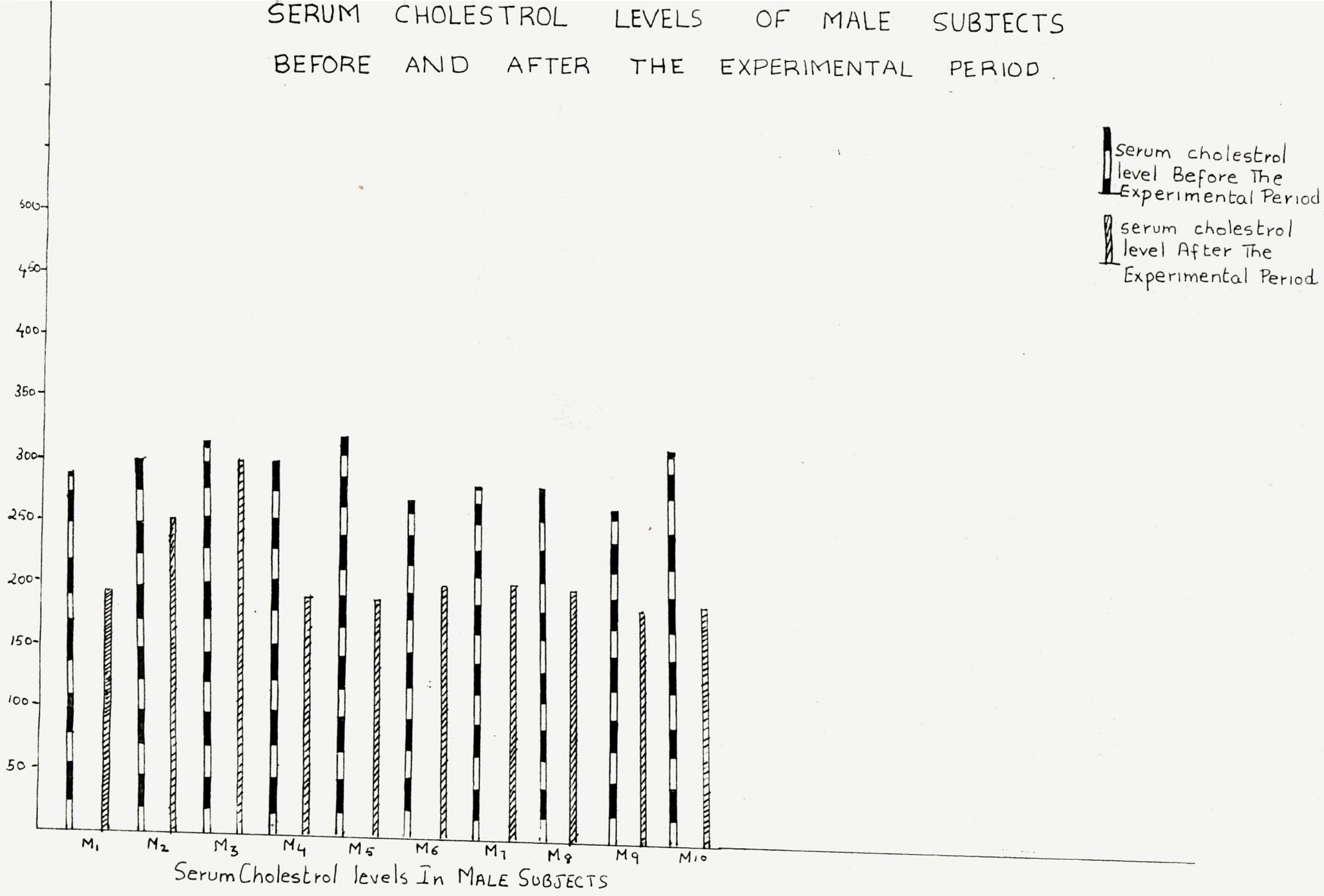
TABLE XIV

SERUM CHOLESTEROL LEVELS OF MALE AND FEMALE SUBJECTS BEFORE AND AFTER THE EXPERIMENTAL PERIOD

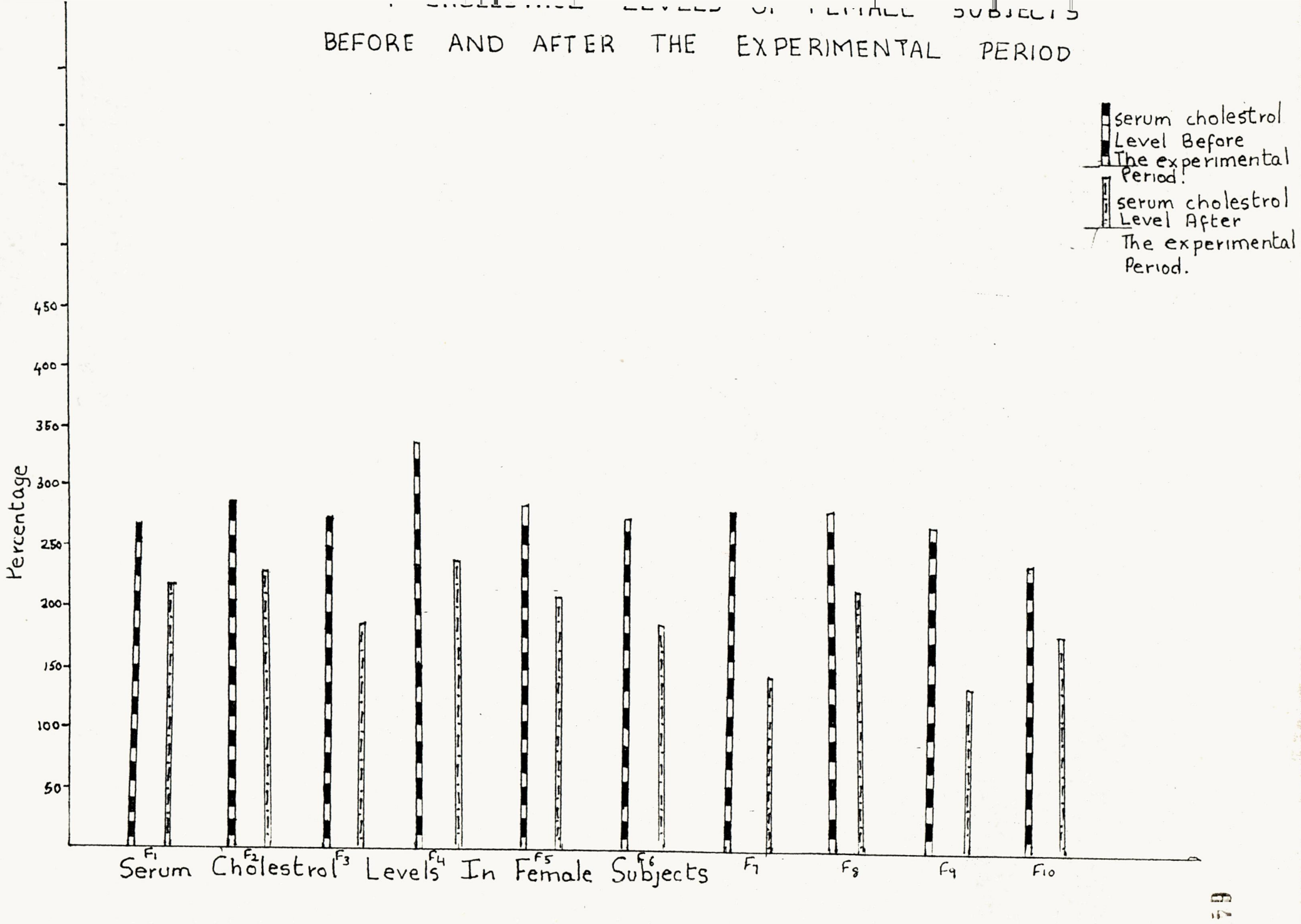
Male subjects	Level before experimental period mg	Level after experimental period mg	Percentage difference	Female subjects	Level before experimental period mg	Level after experimental period mg	Percentage difference
M_1	275	195	29	F_1	256	224	13
M_2	300	250	17	F_2	275	220	20
M_3	306	290	5	F_3	270	190	30
M_4	270	200	30	F_4	302	240	21
M_5	308	190	38	F_5	275	190	31
M_6	255	175	31	F_6	270	180	33
M_7	276	190	31	F_7	260	150	42
M_8	250	200	20	F_8	275	225	18
M_9	260	170	35	F_9	256	150	41
M_{10}	310	198	36	F_{10}	240	190	21

Normal Serum Cholesterol level 150 - 250 mg

SERUM CHOLESTROL LEVELS OF MALE SUBJECTS BEFORE AND AFTER THE EXPERIMENTAL PERIOD.



BEFORE AND AFTER THE EXPERIMENTAL PERIOD



The serum cholesterol levels of male subjects show clear difference after the experimental period. Margetts et al (1986) reported that the serum cholesterol levels in subjects decreased to a notable value when polyunsaturated fatty acids, vegetarian diets was included in the diet. Hence from the table it is shown that there was a difference of 29 percent in subject M_1, 17 percent in M_2, 5 percent in M_3, 30 percent in M_4, 38 percent in M_5, 31 percent in M_6, 31 percent in M_7, 20 percent in M_8, 35 percent in M_9 and 36 percent in M_{10} after the experimental period.

Levels of percentage difference was more in females than in males for subject F_1 the percentage difference was 13 percent, in F_2 20 percent, F_3 30 percent, F_4 21 percent, F_5 31 percent, F_6 33 percent, F_7 42 percent, F_8 18 percent, F_9 41 percent and the percentage difference of subject F_{10} was 21 percent after the experimental period.

Table XV gives the sodium intake of the selected subjects before and after the study.

TABLE XV

SODIUM INTAKE OF MALE AND FEMALE SUBJECTS BEFORE AND AFTER THE EXPERIMENTAL PERIOD

Male subjects	Sodium consumption Initial (g)	Final (g)	Percentage difference	Female subjects	Sodium consumption Initial (g)	Final (g)	Percentage difference
M_1	3.75	2.12	43	F_1	2.95	1.30	56
M_2	5.9	2.02	66	F_2	3.58	1.10	70
M_3	2.91	1.53	41	F_3	2.85	1.01	65
M_4	3.45	1.62	53	F_4	3.43	1.50	57
M_5	3.25	2.32	29	F_5	3.53	1.36	62
M_6	4.5	1.43	68	F_6	3.30	2.10	36
M_7	3.75	1.58	58	F_7	2.95	1.05	64
M_8	2.95	2.08	23	F_8	2.75	1.05	61
M_9	3.85	1.40	68	F_9	3.48	1.02	71
M_{10}	2.19	1.36	38	F_{10}	4.48	1.08	76

Table XV reveals that there was reduction in sodium intake of male subjects ranging from 23 percent to 68 percent after the study period. In the case of females there was 36 percent to 76 percent reduction in sodium intake. This shows that consuming foods less in sodium women are more cautious and want to reduce their hypertension, by reducing the intake of sodium.

Summary and Conclusion

V SUMMARY AND CONCLUSION

The purpose of this study was to find out the dietary in take of hypertensive patients and the effect of four foods that lower hypertension.

The dietary intake by 200 hypertensive subjects was first identified. Of the 200 subjets, 20 subjects were selected for detailed study, of them 10 were males and 10 females.

The socio economic and dietary practices of the subjects were collected using an oral interview schedule. The diets consumed by the subjects in their homes were recorded. On the basis of thier likes and dislikes, the blood pressure lowering four foods were recommended, weight reduction diet was given to those subjects who were obese.

A. Socio Economic status of the subjects studied show that:

The monthly income ranged between Rs 500 - Rs 2000 and above. Three of the male subjects obtained more than Rs 2000 per month and 4 female subjects obtained Rs 2000 per month.

The source of income for both males and female subjects was from business.

B. With regard to the Home diets of the selected subjects before the experimental period the results show that:

i. Food consumption

When compared to the Recommended Dietary Alllowance of ICMR (1984) the male subjects consume less amounts of cereals (-61 percent) other vegetables (-54 percent) and on the other hand female subjects consumed less of cereals - 52 percent other vegetables - 25 percent, Roots and tubers -26 percent, and sugar and jaggery -70 percent.

ii Nutrient intake by the selected subjects

The intake of energy (-44 percent), retinol (-36 percent) Carotene and niacin -41 percent was less when compared with the recommended dietary allowance by ICMR (1984), but the other nutrients were above the recommended allowance.

In the female subjects the intake of energy, and retinol was less than the recommended allowance, and the other nutrients were above the recommended allowance.

C. Recommendation of four foods that tend to lower hypertension

The four foods recommended to the subjects were safflower oil, plaintain stem, cauliflower and ridge gourd. In addition to these main foods all the foods containing high amount of sodium were recommended to be avoided. The study was conducted for a period of 45 days.

D. Consumption of foods and nutrients by the selected subjects during the experimental period.

i. Food consumption

In the male subjects the amount of roots and tubers, fruits, milk fat and oil meat and egg were all found to be decreased during the experimental period, where as it was more before the experimental period.

In the female subjects the amount of other vegetables consumed was found to be more and pulses remained the same during the experimental period. Roots and tubers, milk, fat and meat consumed were all found to be decreased during the experimental period than it was before.

ii. Nutrient intake

Certain nutrient intake in males like energy -36 percent, carbhohydrates - 11 percent, carotene -25 percent were less when compared with the recommended allowances ICMR (1984) but these values were found to be more during the experimental period than before. This was due to the increase in the amount of cereals.

In the female subjects the intake of energy -21 percent, carbhohydrates - 6 percent, Retinol -33 percent was found to be less than the recommended dietary allowance but on comparison of this nutrient intake with the intake before the experimental period it was found that the intake of energy, calcium, retinol, carotene and riboflavine was more during the experimental period.

E. Blood pressure levels Before and After the Experimental period

1. In male subjects: Of the selected male subjects 90 percent suffered from mild hypertension (95 - 104mm Hg) and 10 percent from moderate hypertension (105 -114 mm Hg).

Their blood pressure before the experimental period ranged between 190-140mm Hg the systolic and 110-90 in the diastolic level. After the experimental period a clear decrease in blood pressure was seen and the decrease was seen in a range of 130-120 in the systolic and 80-78 in the diastolic level. In short a percentage deficit of 32 - 7 percent was seen in the systolic and a deficit of 22 -11 was seen in the diastolic region.

ii. In female Subjects:

Out of the 10 females selected for the study 70 percent suffered from mild hypertension (95 -104mm Hg), 20 percent from moderate hypertension (105-114 mm Hg) and 10 percent from moderately severe hypertension (115 - 124 mm Hg).

Their blood pressure before the experimental period ranged between 190 - 140 on the systolic side and 110 - 90 on the diastolic side. The blood pressure after the experimental period was found to be lower than before the period and ranged between 146 - 138 on the systolic side, and 90 - 80 on the diastolic side. In short a percent deficit of 32-7 percent on the systolic side and 20-4 percent on the diastolic side was observed.

F. Serum cholesterollevels Before and After the experimental period

i. In male subjects

The serum cholestrol level is one important factor that tend tc raise the level of blood pressure. It was observed in the male subjects that the level ranged between 310 - 255 mg before the experimental period, and after a period of 45 days with the recommendation of foods the serum cholestrol level decreased between a range of 290 -1/75 mg, in short an occurence of 36 - 5 percentage deficit was seen.

ii. In Female subjects

In the female subjects it was seen that the serum cholestrol ranged between 302 - 240 mg before the experimental period and after an interval of 45 days with the recommendation of blood pressure lowering foods a decrease of serum cholestrol ranged between 240 - 180 mg. In short it can be said that a percentage difference between a range of 42 - 13 percent had occurred.

6. Sodium intake of the subjects before and after the experimental period

i. In Male subjects

In males it was seen that the sodium intake ranged between 3.85 - 2.19 grams before the experimental period, and after the interval of 45 days the decrease of sodium intake ranged between 2.32 - 1.36 grams. Therefore it was observed that a decrease of 68 - 23 percent had occurred.

ii. In Female subjects

A range of 3.58 - 2.75 gms of sodium intake was observed before experimental period, and a range of 2.10 - 1.02 was seen after the experimental period. Therefore a percentage difference of 76-36 percent was observed.

The information attained from above shows that longitudinal studies can be conducted with many of the foods which have tendency to decrease blood pressure and this will help to reduce hypertension in a majority of population and help the people to have long longevity.

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Appendices

APPENDIX I

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN

Questionnaire to Elicit Information on Food Consumption Pattern of People Having Hypertension

1. Name : _____
2. Sex : Male Female
3. Age : _____ in Years Height _____ Weight ____
4. Address :

_____

_____

_____

5. What is your source of Income?

S.No	Source	Tick here
1.	Business	
2.	Rent	
3.	Office	
4.	Professions	
5.	Field	
6.	If other specify	

6. What is your monthly income?(tick)

   Below Rs 500

   Rs 600 - Rs 700

   Rs 800

   Rs 900

   Rs 1000

   above 2000

7. How many members are in your family and give their educational status, age and income

S.No	Name	Age	Eductional status	Income per month
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9,				
10.				

8. How many hours of sleep you get in a day?

   7 hrs.

   8 hrs

   9 hrs.

   More specify

9. Does your profession require a lot of stress?

Yes _____ No _____

10. If 'Yes' do you relax yourself and how?

_____

11. Is your hypertension due to the following?

Alcohol

Cigarettes

Renal disorder

Heredity

12. Are you a: Vegetarian

Non Vegetarian

13. If Non Vegetarian mention the quantity of food consumed per day

S.No	Item	Quantity per day
1.	Egg	
2.	Meat	
3.	Fish	
4.	Chicken	
5.	Others	

14. Do you consume any drugs: for disease other than hypertension which tend to raise B.P?

Yes No

If 'Yes' specify its name _____

15. Do you include the following items in your diet?

S.No	Items	Tick here
1.	Papad	
2.	Chutneys	
3.	Pickles	
4.	Any preserved food	
5.	Smoked and salted food	

16. a) Do you add baking soda in your cooking preparations?

Yes NO

b) If 'Yes' how often do you use it?

17. Do you consume the following and if 'Yes' mention number of cups

S.NO	Item	No.of cups per day
1.	Coffee	
2.	Tea	
3.	Other Beverages	

18. a) Do you include a large number of fried items in your diet?

Yes NO

b) What type of oil do you use for cooking?

Groundnut oil

Gingelly

Castor

Vanaspathi

Ghee

Coconut oil

Sunflower oil

Saffola oil

19. a) Do you consume meals outside do your home?

Yes _____ No_____

b) If 'Yes' at what time of the day?

c) What foods do you usually consume (Please specify)

_____

20. Mention quantity of foods consumed per day

S.No	Items	Quantity per day
1.	CEREALS:	
	Rice	
	Wheat	
	Broken wheat	
	Sooji	
	Ragi	
	Others (Specify)	

2. PULSES:

Red Gram Dhal

Green Gram Dhal

Black gram dhal

Others (Specify)

3. GREEN LEAFY VEGETABLES

Amaranth

Agathi

Corriander

Fenu greek

Others (Specify)

4. ROOTS AND TUBERS

Potato

Carrot

Beetroot

Tapioca

Others (Specify)

5. OTHER VEGETABLES

Cabbage

Beans

Drumstick

Brinjal

Others (Specify)

6. FRUITS

Banana

Orange

Apple

Papaya

Others (specify)

7. SUGAR

Jaggery

8. MILK PRODUCTS

Milk

Butter milk

Curds

Ghee

Butter (specify)

21. Please specify your meal pattern for any 3 consecutive days in a week

S.No	Meal	1		2		3	
		Item	No/Amt	Item	No/Amt	Item	No/Amt
1.	Breakfast						
2.	Midmorning						
3.	Lunch						
4.	Mid afternoon						
5.	Dinner						
6.	Bed Time						

22. Do you have the following symptoms?

S.No	Symptoms	Tick here
1.	Oedema	
2.	Fatigue	
3.	Dizziness	
4.	Headache	

23. How many litres of fluid you consume per day?

24. Do you have any taboos towards certain type of foods?

Hot foods

Cold foods

Foods which causes allergy

25. Blood pressure _____

Diastole

Systole

APPENDIX IV

ESTIMATION OF CHOLESTROL BY ZAK'S METHOD

AIM

To estimate the amount of cholestrol in Serum.

Principle

Cholestrol reacts with ferric chloride in the presence of concentrated sulphuric acid to give a pink colour. The intensity of the colour developed is directly proportional to the amount of cholestrol present and is read at 540 mfs in the colorimeter.

Reagents

i) Stock Ferric Chloride Solution

840 mg of Pure ferric chloride was weighed and dissolved in glacial acetic acid and made upto 100 ml with the same.

ii) Ferric chloride Precipitating Reagent

10ml of the stock ferric chloride reagent was placed in a 100ml standard flask and made upto the mark with pure glacial acetic acid.

iii) Ferric chloride Diluting Reagent

8.5 ml of stock ferric chloride was diluted to 100ml with pure glacial acetic acid in a 100ml standard flask.

iv) Standard Cholestrol Solution

100mg of pure cholestrol solution was placed in 100ml flask containing 0.85 ml of ferric chloride stock reagent, made upto the mark with pure glacial acetic acid. As the working standard, 10ml of this was made upto 100ml with acetic acid. 1ml of the solution has 100 of cholesterol.

Procedure

0.5, 1.0, 1.5, 2.0 and 2.5 ml of the working cholesterol solution was pipetted out into clean dry test tubes. 1ml of this solution contains 100 of cholesterol. The total volume of each tube was made upto 5ml with ferric chloride diluting agent.

To 0.1 ml of the serum was added 4.9ml of ferric chloride precipitating reagent, and mixed well, allowed to stand for a while and centrifuged, transferred to 2.5 ml of the supernatant into a clean dry test tube and added 2.5 ml of ferric chloride diluting agent, mixed well. The tubes were kept in cold water and allowed to cool down to room temperature. A blank was also prepared by having 5ml of ferric chloride diluting agent, 4ml of concentrated sulphuric acid. After 30 minutes, intensity of the colour developed was read at 540 mfs.

Result

The amount of cholesterol present in 100ml of serum was _____ mg

APPENDIX V

FOOD CONSUMPTION THROUGH HOMEDIET BY THE SELECTED MALE SUBJECTS DAY I

Subjects	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and tuber	Fruits	Milk	Fats and oil	Meat and Fish	Egg	Sugar and jaggery
	g	g	g	g	g	g	g	g	g	g	g
M_1	300	75	75	75	50	Nil	300	15	Nil	Nil	30
M_2	275	45	100	50	50	40	250	20	Nil	Nil	30
M_3	275	55	Nil	50	Nil	40	400	15	Nil	Nil	50
M_4	275	75	100	Nil	Nil	Nil	375	20	100	40	50
M_5	250	50	75	Nil	50	40	250	15	Nil	Nil	30
M_6	275	25	Nil	75	Nil	50	275	20	Nil	Nil	50
M_7	225	55	75	75	Nil	40	375	20	Nil	Nil	30
M_8	175	50	100	Nil	Nil	40	325	15	200	Nil	30
M_9	300	80	Nil	75	50	75	325	20	Nil	Nil	50
M_{10}	300	80	NIl	Nil	100	40	275	20	250	Nil	30

FOOD CONSUMPTION THROUGH HOME DIET BY THE SELECTED MALE SUBJECTS II DAY

Subjects	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and tuber	Fruits	Milk	Fats and	Egg	Sugar and jaggery	Meat & Fish
	g	g	g	g	g	g	g	g	g	g	g
M_1	175	45	75	Nil	50	135	300	15	Nil	30	Nil
M_2	225	55	75	Nil	50	75	250	20	Nil	30	Nil
M_3	250	60	75	50	Nil	Nil	375	20	NIl	50	Nil
M_4	200	30	75	Nil	50	75	375	20	Nil	50	100
M_5	200	45	75	75	50	75	325	15	Nil	30	Nil
M_6	225	25	75	Nil	50	75	275	20	Nil	50	Nil
M_7	175	25	Nil	Nil	100	Nil	300	20	Nil	30	Nil
M_8	200	30	75	Nil	50	40	325	15	Nil	30	Nil
M_9	200	45	75	50	Nil	40	235	20	Nil	50	Nil
M_{10}	200	45	100	Nil	Nil	125	275	20	Nil	Nil	30

FOOD CONSUMPTION THROUGH HOME DIET BY THE SELECTED MALE SUBJECTS III DAY

Subjects	Cereals g	Pulses g	Green leafy vegetables g	Other vegetables g	Roots and tuber g	Fruits g	Milk g	Fats and g	Meat & Fish g	Egg g	Sugar and Jaggery g
M_1	225	75	75	75	Nil	NIl	300	15	Nil	Nil	30
M_2	200	45	75	75	50	40	325	20	Nil	Nil	30
M_3	200	55	75	Nil	50	Nil	300	20	Nil	NIl	50
M_4	225	75	Nil	75	50	Nil	325	15	Nil	40	50
M_5	225	45	75	Nil	100	Nil	325	15	Nil	Nil	30
M_6	200	45	Nil	Nil	50	75	275	20	Nil	Nil	50
M_7	225	55	75	Nil	50	Nil	375	20	Nil	Nil	30
M_8	200	45	Nil	75	50	Nil	325	15	Nil	Nil	30
M_9	225	45	Nil	75	50	75	325	20	Nil	Nil	50
M_{10}	300	75	75	75	Nil	Nil	275	20	Nil	40	30

APPENDIX V

FOOD CONSUMPTION THROUGH HOME DIET BY THE SELECTED FEMALE SUBJECTS DAY I

Subjects	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and Tuber	Fruits	Milk	Fats and oil	Meat and Fish	Egg	Sugar and Jaggery
	g	g	g	g	g	g	g	g	g	g	g
F_1	225	50	75	50	Nil	125	375	20	Nil	40	30
F_2	150	30	75	50	50	40	250	15	100	Nil	30
F_3	175	55	100	50	Nil	90	275	20	Nil	Nil	30
F_4	175	25	100	125	50	40	300	20	100	Nil	50
F_5	200	75	150	Nil	50	90	300	15	Nil	Nil	30
F_6	325	25	100	50	Nil	40	300	20	Nil	nil	50
F_7	250	75	50	Nil	50	40	300	15	100	Nil	30
F_8	225	45	150	Nil	Nil	90	300	20	200	Nil	30
F_9	250	75	75	50	Nil	75	250	15	100	Nil	30
F_{10}	250	70	75	Nil	100	Nil	250	20	100	Nil	30

FOOD CONSUMPTION THROUGH HOME DIETS BY SELECTED FEMALE SUBJECTS DAY II

Subjects	Cereals	Pulses	Green leafy vegeta-bles	Other vegeta-bles	Roots and Tuber	Fruits	Milk	Fats and oil	Meat & Fish	Egg	Sugar and Jaggery
	g	g	g	g	g	g	g	g	g	g	g
F_1	225	75	75	Nil	50	40	375	20	Nil	Nil	30
F_2	250	75	Nil	50	75	75	325	15	Nil	Nil	30
F_3	200	30	75	Nil	50	40	275	20	Nil	Nil	30
F_4	225	75	100	Nil	50	115	300	20	Nil	Nil	30
F_5	225	75	Nil	Nil	100	115	300	15	Nil	Nil	50
F_6	200	75	75	Nil	125	75	375	20	Nil	Nil	30
F_7	200	60	75	Nil	100	40	300	15	Nil	Nil	30
F_8	225	45	Nil	Nil	100	90	300	20	Nil	Nil	30
F_9	225	75	Nil	75	-	50	250	15	Nil	Nil	30
F_{10}	175	75	Nil	75	75	90	250	15	Nil	Nil	30

FOOD CONSUMPTION THROUGH HOME DIETS BY SELECTED FEMALE SUBJECTS DAY III

Subjects	Cereal	Pulses	Green leafy vegetables	Other vegetables	Roots and	Fruits	Milk	Fats and	Meat & Fish	Egg	Sugar and Jaggery
	g	g	g	g	g	g	g	g	g	g	g
F_1	300	60	75	125	Nil	40	375	20	100	Nil	30
F_2	200	75	75	Nil	50	40	325	15	Nil	40	30
F_3	225	25	75	50	Nil	95	275	20	Nil	Nil	30
F_4	250	60	Nil	75	125	40	300	20	100	Nil	50
F_5	200	75	75	75	50	40	300	15	Nil	Nil	30
F_6	200	75	100	Nil	50	40	375	20	Nil	Nil	50
F_7	225	90	Nil	50	50	90	300	15	Nil	Nil	30
F_8	175	45	75	Nil	100	40	300	20	Nil	Nil	30
F_9	225	75	100	Nil	Nil	40	250	15	100	Nil	30
F_{10}	225	75	100	50	Nil	50	250	20	1	Nil	30

APPENDIX VI

NUTRIENTS CONSUMPTION FROM THE HOME DIETS BY THE SELECTED MALE SUBJECTS I DAY

Subjects	Energy kcal	Carbho hydrate g	Fat g	Protein g	Calcium mg	Iron mg	Retinol µg	B Caro-tene µg	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
M_1	1552	270.7	16.77	50.2	857.7	30.28	522	5186.4	0.4	2.0	11.35	6.5	88.5
M_2	1677	298	35.28	47.33	990.7	38.97	435	4681.4	0.9	1.26	13.485	3.5	123.3
M_3	1717	243.24	17.52	36.29	684.4	14.63	522	586.7	1.093	1.369	12.03	3.12	24
M_4	2066	326	77.5	79.7	1906.4	16,2	666	741.4	1.809	1.754	10.475	4.7	75
M_5	1353	279.2	30.3	46.18	36.99	39.24	435	4242.7	2.32	6.789	12.73	3.72	107.3
M_6	1730	292.45	15.31	63.03	832.9	37.63	460.5	370.1	0.82	1.561	11.46	4.85	35.6
M_7	1644	263.1	42.28	56.2	962.1	27.46	666	2232.7	0.164	1.476	10.485	3.25	51.85
M_8	1497	214.2	36.54	79.38	1055.2	35.65	435	6035.6	0.898	1.066	7.31	4.18	116
M_9	1907	338.5	34.92	55.98	648	25.9	435	5015	1.192	15.527	13.78	3.08	37.65
M_{10}	2203	310.15	11.15	142.38	292.8	29.47	348	143.6	1.442	6.548	8.555	4.58	30.3

NUTRIENTS CONSUMPTION FROM HOME DIETS BY THE SELECTED MALE SUBJECTS II DAY

Subjects	Energy kcal	Carbho hydrate g	Fat g	Protein g	Calcium mg	Iron mg	Retinol µg	B Caro-tene µg	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
M_1	1707	255.2	40.2	39.6	1.20	14.61	522	4.754	0.3	1.8	10.4	5.6	75.6
M_2	1596	255	34.67	46.58	738.2	23.77	435	378.6	0.08	1.183	10.85	3.9	105.2
M_3	1524	306.3	36.49	57.65	149.9	14.05	522	4150	1.12	2.68	6.8	3.75	140.2
M_4	1521	253.4	30.6	40.3	5.613	10.4	522	4124	1.2	1.6	6.8	3.72	52
M_5	2735	250	30	33.2	55.7	22.2	435	2265	2.3	214	7.230	2.4	76.5
M_6	1595	323.75	46.3	41.7	1330.2	257.9	579	4629	1.677	1.296	1.25	1.23	156.2
M_7	1439.3	208.9	37.31	72.85	1571.05	512.775	522	990	1.201	1.766	5.63	4.65	37.165
M_8	1251	234	18.23	32.28	581.35	15.73	435	469	0.07	1.793	9.15	5.08	129.1
M_9	1305	253.4	34.64	40.73	878.45	30.675	43 5	4327	1.006	1.989	10.435	5.05	88.1
M_{10}	1437	228.3	38.12	46.48	753.45	34.258	492	6575	1.913	1.281	10.825	2.3	135.4

NUTRIENTS CONSUMPTION FROM HOME DIETS BY THE SELECTED MALE SUBJECTS III DAY

Subjects	Energy Kcal	Carbho hydrate g	Fat g	Protein g	Calcium mg	Iron mg	Retinol g	B Caro tene g	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
M_1	1423	259.5	13.7	48.65	863	15	522	20.1	0.3	1.7	8.2	5.2	104.5
M_2	1442	240.1	34.48	42.93	62.65	12.46	435	779.3	1.541	0.99	10.36	14.175	117.35
M_3	1420	255	81.84	39.88	716.23	14.7	522	430	1.02	2.4	6.7	6.85	123.5
M_4	1642	230	35	42	527	9.2	666	329	2.3	1.8	8.3	6.4	70.2
M_5	1503	247.4	28.5	36	1342	25.42	435	5097	2.3	2.4	8.9	3.9	37.8
M_6	1531	215.75	33.3	35.07	442.1	36.01	460.5	1278	1.491	0.473	8.705	4.75	22.15
M_7	1411	255.4	35.9	42.55	751.3	14.84	522	165.9	1.557	1.089	1.56	2.28	104.6
M_8	1698	253.7	36.09	85.4	769.6	6.67	435	325.4	1.363	1.691	14.37	4.52	17.25
M_9	1427	267.9	34.97	45.98	227.7	25.34	435	518.5	1.89	0.944	12.28	1.85	14.05
M_{10}	1635	233.7	37.93	92.72	1346.4	19.56	144	4535.9	37.65	1.443	3.92	2.2	132.8

APPENDIX VII

NUTRIENTS CONSUMPTION FROM HOME DIETS BY THE SELECTED FEMALE SUBJECTS I DAY

Subjects	Energy kcal	Carbh o hydrate g	Fat g	Protein g	Calcium mg	Iron mg	Retinol g	B Caro tene g	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
F_1	1603	255.3	38.82	89.58	99.1	23.64	666	2851.7	0.43	1.414	13.35	3.85	81.9
F_2	1220	100.1	30.96	50.15	111.18	11.08	435	285.1	1.128	1.105	6.32	4.35	108.4
F_3	1441	214.8	31.41	78.43	663.1	35.005	348	589.08	0.83	0.677	9.85	3.7	119.8
F_4	1578	240.2	40.3	68.23	1765.6	14.19	522	566.3	0.12	1.133	9.535	2.4	196.1
F_5	1542	260	33.7	54.88	1431.7	25.12	522	4856.4	1.979	1.034	11.905	3.1	256.8
F_6	1881	344.5	41.83	49.13	875.6	37.235	522	5043	1.135	1.378	8.51	2.84	11.39
F_7	1693	276.2	31.98	69.05	464.1	36.13	348	2961.8	1.201	1.534	11.56	3.02	148.4
F_8	1868	280.1	22.91	90.28	1080.7	34.63	522	4254.4	1.75	1.295	48.4	3.31	189.6
F_9	1714	277	33.27	75.83	622.1	33.182	435	547	1.992	1.07	13.22	1.49	122.8
F_{10}	1520	225.2	89.2	73.8	244.3	26.42	348	2691.2	1.522	1.03	11.04	2.01	132.9

NUTRIENTS CONSUMPTION FROM HOME DIETS BY THE SELECTED FEMALE SUBJECTS II DAY

Subjects	Energy Kcal	Carbho hydrate g	Fat g	Protein g	Calcium mg	Iron mg	Retinol g	B Caro tene g	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
F_1	1630	273.6	36.23	53.45	848.6	21.895	522	5149.3	1.467	1.103	11.125	3.7	134.7
F_2	2367	294.8	31.89	60.43	632.5	21.69	435	840.9	0.08	1.12	33.42	2.9	208.55
F_3	1158	211.9	32.92	32.13	119.85	16.148	348	5536.2	0.904	1.973	9.8	1.87	144.3
F_4	2180	294	37.66	51.83	935.9	17.94	522	6832.9	1.74	2.199	11.285	2.7	127.2
F_5	1527	270.7	32.74	48.81	817.35	18.62	522	1774	1.91	1.422	91.92	4.2	453
F_6	1657	281.5	38.24	47.13	1409.95	20.64	522	5389.1	0.153	1.963	11.25	3.08	162.86
F_7	1440	253.6	28.65	47.43	549.9	25.18	348	5106.2	1.309	0.287	11.37	5.95	140.6
F_8	1472	255.7	35.61	42.2	515.8	13.06	522	1201.2	1.62	1.022	102.1	2.1	33.66
F_9	1572	257.7	29.85	48.65	768.1	18.01	435	405.8	0.25	1.825	10.32	3.2	25.25
F_{10}	1258	222.9	30.8	34.25	192.8	20.61	522	4805.2	1.52	1.053	9.82	1.42	32.5

NUTRIENTS CONSUMPTION FROM HOME DIETS BY THE SELECTED FEMALE SUBJECTS III DAY

Subjects	Energy kcal	Carbho hydrate g	Fat g	Protein g	Calcium mg	Iron mg	Retinol g	B Caro tene g	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
F_1	2014	311.2	43.8	84.93	1820.2	35.23	522	4384.5	1.757	1.318	14.025	2.34	148.35
F_2	1068	248.2	20.77	52.25	983.25	34.663	579	5897.4	1.152	2.112	10.625	5.7	92.8
F_3	1517	233.4	31.66	75.91	411	22.76	341	2141.3	7.9	0.736	10.11	6.3	23.2
F_4	1793.3	282.5	38.78	64.73	950.9	19.13	522	1199	1.216	1.0	9.345	1.2	25.3
F_5	1556	267.2	30.94	43.48	969.6	31.605	522	4248.1	1.515	1.194	105.3	2.56	95.45
F_6	1683	293.4	36.73	43.53	1963.9	19.3	522	6447	1.148	0.948	5.508	1.251	180.3
F_7	1583	283.7	27.81	49.25	458.2	18.24	348	367.7	1.924	0.871	12.55	2.95	31.8
F_8	1164	225.2	15.18	36.88	691.75	13.75	522	1137.83	0.793	4.504	7.855	1.6	108.8
F_9	1771	279.6	34	71.18	1799.4	20.9	435	5533.5	2.11	1.228	4.885	4.8	176.8
F_{10}	1524	262.1	32.5	55.3	789.4	15.3	522	1375.2	2.05	1.32	2.8	1.3	123.3

APPENDIX VIII

FOOD CONSUMPTION BY SELECTED MALE SUBJECTS DURING THE EXPERIMENTAL PERIOD

Subjects	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and Tuber	Fruits	Milk	Fats and oil	Meat and Fish	Egg	Sugar and jaggery
	g	g	g	g	g	g	g	g	g	g	g
M_1	325	61	25	100	14	31	250	22	243	14.3	40
M_2	350	60	15	93	54	54	200	17	243	14	40
M_3	294	53	26	83	18	64	150	22	Nil	Nil	40
M_4	258	25	20	90	46	36	250	28	36	14	50
M_5	250	55	30	105	48	36	275	17	23	14	40
M_6	290	50	15	105	41	41	200	22	Nil	Nil	50
M_7	316	52	11	93	48	36	200	17	Nil	Nil	40
M_8	291	46	20	Nil	31	39	275	22	36	14	40
M_9	325	63	10	121	Nil	35	225	17	36	14	30
M_{10}	308	48	24	101	50	37	225	22	23	14	30

APPENDIX VIII

FOOD CONSUMPTION BY SELECTED FEMALE SUBJECTS DURING THE EXPERIMENTAL PERIOD

Subjects	Cereals	Pulses	Green leafy vegetables	Other vegetables	Roots and Tuber	Fruits	Milk	Fats and oil	Meat and Fish	Egg	Sugar and jaggery
	g	g	g	g	g	g	g	g	g	g	g
F_1	300	54	48	77	23	52	150	22	63	Nil	30
F_2	228	20	31	88	29	64	200	22	-	Nil	30
F_3	200	50	31	80	29	27	200	19	33	Nil	25
F_4	236	48	30	79	40	15	100	22	-	Nil	30
F_5	255	22	40	78	28	50	225	20	-	Nil	30
F_6	250	50	30	78	51	38	225	19	56	Nil	25
F_7	250	55	48	79	31	25	200	22	56	Nil	40
F_8	205	48	50	65	16	38	200	22	Nil	Nil	40
F_9	206	71	58	72	43	52	200	22	Nil	Nil	25
F_{10}	275	52	65	57	16	38	200	15	Nil	Nil	25

APPENDIX IX

NUTRIENTS CONSUMPTION FROM DIET DURING THE EXPERIMENTAL PERIOD BY MALE SUBJECTS

Subjects	Energy kcal	Carbho hydrate g	Fat g	Protein g	Calcium mg	Iron mg	Retinol g	B Caro tene g	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
M_1	1971	234.5	12.27	62.7	1382.1	25.1	541	1897	0.43	0.68	10.82	1.2	102.5
M_2	1938	225.2	35.2	46.82	1083.6	27.4	545	2282	0.43	1.718	11.80	1.0	100.3
M_3	1884	213.1	29.41	44.60	1166.5	23.5	522	1780	1.23	1.84	10.51	0.52	90.9
M_4	1812	223.4	25.25	55	994.5	26.4	659	1362	0.6	1.443	25.79	1.52	97.2
M_5	1784	208.6	22.45	38.46	116.5	28.2	558.5	3852	0.57	1.516	10.5	1.8	92.07
M_6	1782	221.7	29.52	46.6	1169.5	25.4	534	2120	1.93	6.95	10.14	1.4	101.5
M_7	1782	221.7	24.12	57.2	1296.3	28.2	519	1179	1.52	1.86	8.01	1.5	54.5
M_8	1725	222.6	12.2	61	1209.1	28.6	439	294.4	2.83	2.149	11.3	2.9	67.4
M_9	1847	242	16.48	48.5	1368.6	26.32	479	580	0.64	1.02	14.17	10.6	45.2
M_{10}	1845	228.3	14.1	93.88	1289.3	25.4	459	1782	2.63	2.08	12.93	1.9	81.83

APPENDIX X

NUTRIENTS CONSUMPTION FROM DIET DURING THE EXPERIMENTAL PERIOD BY FEMALE SUBJECTS

Subjects	Energy kcal	Carbho hydrate g	Fat g	Protein g	Calcium mg	Iron mg	Retinol g	B Caro tene g	Thiamine mg	Ribo flavine mg	Niacin mg	Sodium g	Vitamin C mg
F_1	1843	259.8	23.5	71.8	1292.3	43.85	542	3125	0.35	1.24	20.92	1.5	101.4
F_2	1798	242	12.40	52.3	1050.8	40.51	535	2425	0.82	1.28	83.02	0.89	106.2
F_3	1672	222	18.06	35.8	956.5	62.81	398	2522	1.34	1.54	29.82	1.2	90.4
F_4	1850	252	23.91	55.6	951.3	45.04	542	2463	1.92	1.42	18.05	2.1	10.012
F_5	1742	235.7	19.4	45.05	603.15	57.2	532	2680.7	1.93	1.45	18.07	1.02	10.49
F_6	1790	266.4	19.54	43.61	1027.7	183.81	548	3425	1.84	2.27	21.25	2.2	100.2
F_7	1772	240.9	14.8	72.61	1068	82.2	500	3871	1.52	1.28	19.42	1.30	114.7
F_8	1532	220	15.2	49.2	615	80.4	528	2324	0.63	1.21	29.36	1.02	118.8
F_9	1530	215	15.5	50.1	972	78.4	453	2761	0.42	1.638	18.52	2.0	103.65
F_{10}	1760	241.1	18.25	69.2	667.7	60.6	442	2772	1.25	1.25	30.07	1.24	92.2