INCIDENCE OF CARDIOVASCULAR RISK FACTORS AMONG SELECTED ADULT POPULATION CONSUMING DIFFERENT FATS AND OILS

BY

KAVITHA .K

A THESIS SUBMITTED TO

THE AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN (DEEMED UNIVERSITY) COIMBATORE-641 043

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN FOOD SERVICE MANAGEMENT AND DIETETICS

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CERTIFIED AS BONAFIDE RESEARCH WORK

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Introduction

I. INTRODUCTION

"The fat you eat is the fat you wear"

(Vash, 1989)

Health is fundamental to human progress. It is the foundation for physical, mental , emotional, social and economic development of the nation. Many developing countries including India face a universal problem of adult morbidity and mortality due to cardiovascular diseases like coronary heart disease and hypertension (Bhatia, 1995).

According to Park (1995) the epidemics of coronary heart disease began at different times in different countries. In United States epidemics began in the early 1920s, in Britain in the 1930s, in several European countries still later, and now the developing countries are catching up. Shills (1994) and Romero et al (1996) revealed that cardiovascular disease has become the leading cause of death in the country and it accounted to nearly one million death in the United States, almost half of the total deaths with 18% of these deaths occurring in patients under 65 years of age. About 1.5 Americans undergo cardiovascular operations, 1.5 Americans experience a heart attack and 2.18 Americans suffer from Rheumatic heart disease.

Ambujam (1996) reported that the Indians have the highest rates of coronary heart disease in the world. Recent studies, from the United Kingdom, United States, Singapore

and other countries have conclusively shown that immigrant Indians have coronary heart disease rates far more than the host population. In a survey conducted in Chandigarh the prevalence was found to be 65.4 and 47.8/1000 in males and females respectively and in a village in Haryana the prevalence was 22.8 and 17.3/1000 in males and females respectively. These studies have confirmed that high coronary heart disease rates are not unique to affluent migrant Indians; they are high in Indian subcontinent also.

Kumar and Clark (1994) stated that in the Western hemisphere 50% of the deaths are related to cardiovascular disease. The incidence of Rheumatic heart disease is predominant in countries with poor sanitation, over crowding and malnutrition. Cardiovascular disease most frequently affects in the middle age (Robinson, 1987), but the seeds of the disorder seem to be sown decades earlier and it can begin "Silently" while people are still in their teens and 20s. Hence it is better to guard against it to establish a "Health for all by 2000 A.D". (Levy and Shireffs, 1989).

An important goal of the present health care system involves the prevention of the disease. No single risk factor is the cause of cardiovascular disease, a number of risk factors contribute to the aetiology of the cardiovascular disease. The various risk factors are

"Controllable risk factors" like smoking, consuming alcohol, stress, sedentary life, behavior patterns and food habits and **"Uncontrollable risk factors"** like heredity, hypertension, increased cholesterol, diabetes-mellitus and syndrome X. While the uncontrollable risk factors has to be accepted, the controllable risk factors cannot be overlooked for the prevention of cardiovascular diseases.

Food is the starting point to maintain and improve health. Diet plays a vital role in the cause of this multifaceted disease. Among the dietary factors the most important are the nature and quantity of fat intake which plays an important role in determining the incidence of cardiovascular disease.

According to Esrey, Joseph and Grover (1996) the diet heart hypothesis proposes that elevated intake of total fat, saturated fat and dietary cholesterol, increase serum cholesterol which in turn increase the risk of developing cardiovascular disease. Wolfram (1996) stated that primary prevention of atherosclerosis by taking low fat diet is very important since cardiovascular disease is the major determinant of premature death.

The dietary fat consists of saturated fat, polyunsaturated fat, monounsaturated fat and total fat.

Kaare and Norum (1992) stated that the effects of saturated fat on serum cholesterol are seen only with saturated fatty acids having chain lengths of 12-C (Lauric acid), 14-C (Myristic acid) and 16-C (Palmitic acid) atoms; all these increase the total cholesterol by increasing the concentration of LDL (Low density lipoprotein). The shorter chain fatty acids have little influence on plasma LDL. He has also confirmed that stearic acid has neutral effect failing to increase LDL-C plasma. According to Sanders et al (1983) reduction of saturated fat content of the diet (<6% dietary energy) by reducing the total fat content of the diet or by exchanging saturated fat with unsaturated fat, reduced the total plasma cholesterol levels by about 12% in normocholesterolaemic subjects.

In case of polyunsaturated fat (PUFA), studies have shown that plasma total cholesterol and LDL levels falls as percentage of calories from PUFA increases. (Kaare, 1992). Vega et al (1983) clearly stated that on PUFA diet the mean cholesterol level decreased by 25% and HDL-C increased by 15%. According to Laine et al (1983) all the PUFA diets produced small but significant reductions in the cholesterol to protein ratio of all the 3 lipoproteins.

Recent studies demonstrated that substitution of saturated fat in the diet with monounsaturated fat have a

plasma cholesterol lowering effect. Mattson (1995) stated that MUFA is equivalent to PUFA in lowering blood LDL-C. It apparently have the added advantage of not causing a decrease in HDL-C or an increase in blood triglyceride (TG) because the Framingham study showed that a combination of an elevated serum TG along with a low HDL-C level is a potent risk factor for atherosclerosis leading to coronary heart disease.

The World Health Organisation has suggested upper limits of each fatty acid for the prevention of heart disease;

Saturated fatty acid - 8 - 10 en%

Polyunsaturated fatty acid - 5 - 8 en%

MUFA should contribute the difference. The desirable PUFA to SFA ratio is above 0.8 to 1, (Ghafoorunisa, 1995).

Thus the role of fats and oil in cardiovascular disease has now come into focus. Fat being one of the major food component in India, the role of each fat in determining the incidence of cardiovascular disease was studied. The fatty acid composition differs for each oil and hence each oil constitutes a different role in affecting the plasma cholesterol levels and normal functioning of the heart. Coconut oil and palm oil have long chain saturated fatty acid percentage higher than other oils like sesame, groundnut, mustard, safflower and sunflower (IJMR, 1995).

According to Sugano and Imaizumik (1990) palm oil increased serum cholesterol more than did safflower oil. According to Reddy et al (1996) palm oil is comparable to groundnut oil and may not induce hypercholesterolaemia in Indian subjects consuming cereal based diets containing 30% total fat and low cholesterol. Subramaniam et al (1993) stated that sesame oil diet significantly reduced lymphatic absorption of cholesterol and fatty acids whereas coconut oil increased the lymphatic absorption of oleic acid but had no significant effect on cholesterol absorption.

Thus to find the incidence of cardiovascular disease based on fat and oil consumption the present research study is conducted with the following objectives to

- Study the incidence of cardiovascular disease among the adult population consuming different fats and oil.
- Understand the regular dietary pattern of the selected adults.
- Observe the consumption pattern of different fats and oil.
- Find the association of waist-hip ratio and body mass index with the fat consumption pattern of adults and
- Analyse serum lipid-profile to know the relationship between fat consumption and the incidence of cardiovascular disease.

Review of Literature

II. REVIEW OF LITERATURE

The review of literature pertaining to the study on "Incidence of cardiovascular risk factors among the selected adult population consuming different fats and oils". is dealt under the following headings:

A. Prevalence and risk factors of cardiovascular disease.

B. Association of life-style pattern with cardiovascular diseases.

C. Relationship of body mass index and waist-hip-ratio with the incidence of cardiovascular diseases.

D. Effect of fats and fatty acids on serum lipids.

E. Role of hypocholesterolaemic foods on heart disease.

A. PREVALENCE AND RISK FACTORS OF CARDIOVASCULAR DISEASE.

Cardiovascular disease is the leading cause of mortality (Butcait et al 1995) and the prevalence is 36% in women and 38.7% in men and increases with age in native Americans (Kuller, 1994). Voukiklaris et al (1996) reported that the prevalence of coronary heart disease has increased from 0.7% in 1960 to 9.5% in 1991 in Crete, Greece.

Liu and Horlick, (1996) accentuated that the prevalence of angina gradually increased with age form 1.7% (18-34 age group) and 3.81 (35-54 age group) and 4.8% (55-74 age group) in men and among women it ranged from 2.5%, 4% and 7.1% in the same age group in rural areas in Saskatchewan.

In India cardiovascular disease is an important contributor to mortality (Reddy, 1993) and by 2000 A.D nearly five crore people would be affected by cardiovascular disease (Sharma, 1997) and the incidence has increased particularly in large towns (Sinha et al 1990).

The incidence rates in rural and urban population in India ranged from 14.8 per thousand to 65.4 per thousand. Most studies have shown that the rates are lower in rural population. The incidence in urban population ranged from 31.5 to 65.4 per thousand in males and 25.3 to 47.8 per thousand in females. Estimated prevalence of ischaemic heart disease in persons above the age of 40 years ranged form 2.5 to 8.5 per cent (Trehan and Misra, 1996). Gupta et al, 1994 reported that in rural Rajasthan, the coronary heart disease rate is 46.4 per thousand and 30.8 per thousand in Punjab (Wander, 1994).

Holme (1983), Kuller (1996), Lamarche (1996), Ginter (1995), Challappa (1996) and Durairaj (1997) validated that the risk factors responsible for the development of cardiovascular disease are cigarette smoking, physical inactivity, diabetes mellitus and family history of ischaemic heart disease.

Weijenber et al (1995) established that total cholesterol and systolic blood pressure are stronger independent risk factors for mortality from myocardial ischaemia among elderly men and women. Bostom et al (1996) observed that elevated plasma Lp (a) is an independent risk factor for the development of premature coronary heart disease in man and is supported by Anantharam (1996).

B. ASSOCIATION OF LIFE-STYLE PATTERN WITH CARDIOVASCULAR DISEASE.

The world congress on consensus on cardiology held in Delhi in December 1995 came to the conclusion that **"Surgery has limited use and in many case useless"** and the disease can be managed by suitable changes in life-style because medicines have their own limitations (The Hindu, 1996).

Cunnane (1995) corroborated that smoking, high habitual dietary intake of total fat and saturated fat, low exercise level and excessive alcohol consumption are correlated with elevated serum cholesterol, obesity, hypertension and premature death from coronary heart disease and Mart and Barozzoni (1992) reported that the apparent effect of these behavioral traits on biological risk factors for cardiovascular disease is modest but may be relevant to prevention.

Smoking significantly increases serum cholesterol and blood pressure levels, while the HDL levels decreased due to inverse relationship between cholesterol and HDL.C. Chain smoking has deleterious effect with regard to cholesterol and blood pressure (Dewan and Rowlands, 1982) and smoking alone increases the incidence of coronary artery disease two fold (Challappa, 1996) and it is illustrated by Feldman, 1992 that passive smoking changes the lipid profile.

According to Thomson et al (1988) there is a greater risk of coronary heart disease in those with a high alcohol intake and total mortality is higher because in alcohol consumers the dietary intake varied with the alcohol consumption; more alcohol increased consumption of saturated fat and decreased PUFA and fibre. Hein et al (1996) explicated that in middle aged and elderly men the inverse association between alcohol consumption and ischaemic heart disease is highly dependent on the concentrations of LDL.C. Sharper. et al (1987) in his study indicated that people who were drinking in less amounts had the lowest incidence of ischaemic heart events.

Victor (1996) highlighted that consumption of redwine reduces LDL.C and both wine and non-wine derived alcohol consumption appear to exert a protective effect against myocardial infarction which is partly mediated through an increase in HDL.C (Vidal et al, 1996).

A study conducted at U.K, revealed that in a person who do aerobic exercise continuously for some years the arteries gets activated and grow which is called revascularisation. If two such arteries on either side of the block grow and join, the result will be a natural bypass thus preventing cardiovascular disease (Reed, 1995). Neibauer (1995) justified that intensive physical exercise and low fat diet remain an effective part of treatment of coronary artery disease. Motoyama et al (1996) suggested that low term low intensity aerobic training improved the profile of serum lipid and lipoprotein concentration, while detraining returned the profile to that of the pretraining levels. Practice of yoga helps to prevent heart ailment and promote heart care through mental relaxation (The Hindu, 1995). Tina (1988) and Palmer et al (1995) showed that heavy coffee consumption increases the risk of myocardial infarction and moderate coffee consumption is not associated with an increased risk of cardiovascular disease (Binns, 1995).

C. RELATIONSHIP OF BODY MASS INDEX (BMI) AND WAIST-HIP-RATIO(WHR) WITH THE INCIDENCE OF CARDIOVASCULAR DISEASE

According to Raison et al (1989) indices of body fat distribution namely BMI, WHR and fat fold measurements have been found to be positively related to blood pressure, glycemia, cholesterol and triglyceride levels and negatively to HDL-C levels.

Karhapha et al (1994) confirmed in his study deleterious effect of an upper body regional fat distribution in obese women independent of the degree of obesity on lipoprotein lipid risk factors of cardiovascular disease. Srinivasan (1996) pointed out that excess body weight in adolescence persists into young adulthood and has a strong adverse impact on multiple cardiovascular risk factors.

Relationship between BMI and mortality was studied by Sorkin et al (1995) and he reported that there was no increase in mortality until a BMI of 27.5 or greater is reached and stated that there was progressive increase in mortality with increasing BMI.

The lowest mortality rate related to cardiovascular disease occurs in individuals who remain lean throughout life. A healthy weight one that optimizes the cardiovascular risk profile corresponds to a BMI of 22.6 for men and 21 for women. If this BMI were achieved there would be 25% less coronary heart disease and 35% fewer strokes or episodes of cardiac failure (Meisler and Jeor, 1993).

Negri et al (1992) brought about a relationship between BMI and acute myocardial infarction by stressing the role of higher serum cholesterol levels in the prevalence of hypertension, cardiovascular disease and diabetes among fatter persons.

Waist circumference exceeding 94cm in men and 80cm in women helps to identify people at increased cardiovascular risk stated Han et al (1996).

According to Loss and Halais (1991) and Calvert (1992) WHR technique was found both reliable and valid as an obesity screening technique for cardiovascular disease risk. WHR is superior to BMI in accounting for changes in adipose tissue which occurs with age. A more meaningful fat profile may be obtained by using both indices together. WHR of 1.0 for men and 0.8 for women may be representative of excess abdominal obesity.

Machda et al (1992) spotted that HDL.C and TG levels are associated with WHR and WHR is a valid estimate of body fat distribution with respect to their relationship with cardiovascular risk. Cut-off points for WHR that may define high risk for cardiovascular disease has been suggested for men(0.95) and women (0.8). These are based on primary white populations and these may not be hence appropriate for women, older age groups and some racial or ethnic groups in the United States (Croft et al, 1995).

D. EFFECT OF FATS AND FATTY ACIDS ON SERUM LIPIDS.

Current interest in reducing heart disease risk by diet involves attention to total fat, saturated, monounsaturated, polyunsaturated and transfatty acids, as well as dietary cholesterol (Dwyer, 1995). Each fatty acid play an important role in affecting the serum lipid profile of a person. The fatty acid composition of different oils is given below in Table I.

TABLE I

FATTY ACID COMPOSITION OF DIFFERENT OILS

FATTY ACID	OIL			
	SESAME	COCONUT	SUNFLOWER	GROUNDNUT
SATURATED				
Myristic (14.0)	----	44.52	0.38	0.91
Stearic (18:0)	3.5-7.9	8-11	5.46	1.7
Palmitic (16:0)	18.4-11.9	13.19	4.27	12.6
UNSATURATED (18:1)				
Oleic (18:1)	34.6-47.3	5-8	35	47
Linolic (18:2)	27.9-47.2	----	----	29.9
Linolenic (18:3)	1.8	< 3	57	----

Footnote

Temme et al, (1996) reported that lauric acid raises total cholesterol concentrations more than palmitic acid, which is partly due to a stronger rise in HDL.C. Watts, et al (1996) explicated that the progression of coronary heart disease is strongly related to intakes of both long-chain saturates and transunsaturates, the effects of 18:0 (Stearic) and t-18:1 (Elaidic) possibly being, independent of plasma cholesterol concentration.

Saturated fat and cholesterol intake affect the risk of coronary heart disease as predicted by their effects on blood cholesterol concentration (Ascherio. et al, 1996).Neuhans, et. al (1996) authenticated that saturated fatty acids are directly correlated with coronary heart disease. Butter rich in saturated fatty acids elevated serum cholesterol and LDL.C significantly above the normal values (Wood. et al, 1991).

Hydrogenated fat cholesterol diet caused large increase in plasma cholesterol levels as compared to diets containing hydrogenated fat or cholesterol alone in rats (Sohal & Singh 1986). Denke (1994) pointed that cocoa butter rich in saturated fatty acids raise LDL.C concentrations more than do most liquid vegetable oils.

Contrary to the predictions of the Keys and Hegested equation the evidence for the substitution of palm oil or its liquid fractions for habitual fats in the diet does not result in an elevation of total serum cholesterol is given. An important explanation of why palmoil does not "Obey" the Keys and Hegested model is that its 16:0 content being predominantly esterified at the alpha position does not raise the blood cholesterol levels in contrast to 16:0 in butter esterified at beta position. Another possible reason for the unexpected non-hypercholesterolaemic action of palm oil is that the oil is very rich in tocotrienols, the unsaturated analogue of tocopherols. They reportedly inhibit cholesterol synthesis thus exerting a hypocholesterolaemic action in human and animal models (Tony & Wai, 1994).

Ghafoorunisa (1995) reported that use of palm oil along with any other vegetable oil will favorably shift the dietary PUFA/SFA and n-6/n-3 ratios closer to the recommended range and provide an additional advantage because of the antioxidant properties of tocopherols and tocotrienols.

Bajaj (1996) highlighted that coconut oil with one percent PUFA is not heart-friendly and Beynen and West (1983) proved that when diet with caesin and coconut oil was fed in rabbits there was an increase in the cholesterol content of all lipoprotein fractions.

Ranga Rao (1986) stated that an increase in PUFA content in the diet brings down total cholesterol. Dietary consumption of omega 3 PUFAs found in sea food and fish oils is associated with a decrease in coronary heart disease and overall cardiovascular mortality (Engler, 1994).

Plasma lipid changes due to PUFAs in partially hydrogenated soyabean oil, corn oil and sunflower oil fed in reduced fat diets of free living adults were compared. All the 3 diets lowered total cholesterol (11%) and LDL-C (13%) without triglyceride changes (Insull et al, 1994).

Muniz et al (1995) conveyed that when rats were fed with sunflower oil fried sardines there was a significant reduction in cholesterol content of serum low density lipoproteins. Laine et al (1993) accentuated that maize oil and unhydrogenated soyabean oil were equally effective in lowering total and LDL cholesterol and plasma cholesterol concentrations decreases significantly with diets enriched with corn oil than olive oil (Lichtenstein, 1994).

Mattson (1992) stated that MUFA is equivalent to PUFA or low fat diets in lowering blood LDL-C. He adds that MUFA apparently have the added advantage of not causing a decrease in HDL-C or an increase in blood TG and Zambon et al (1995) proved that when a diet rich in MUFA was given to

hypercholesterolaemic patients significant reductions of total LDL and VLDL-C, TG and apo.B occurred regardless of phenotype. Dietary supplementation of mustard and safflower oil decreased total and LDL-C (P = 0.004 and P = 0.019) and increased HDL-C (P = 0.007) in men with low cholesterol levels (Singhal et al, 1996).

Kabaladze and Vil (1992) stated that fish oils are promising agent for prevention and treatment of dislipoproteinaemia and atherosclerosis. Kirchgessner et al (1983) established the fact that phospholipids in plasma lipoproteins were increased by consumption of olive oil but was unchanged by fish oil in pigs.

E. EFFECT OF HYPOCHOLESTEROLAEMIC FOODS IN HEART DISEASE.

For the primary and secondary prevention of coronary heart disease different measures are useful ie. low fat diet, n-3 fatty acids, dietary fibre, flavonoids, antioxidative vitamins and physical fitness (Wolfram, 1996).

A comparative study on hypocholesterolaemic effects of rice bran and wheat bran on plasma and liver cholesterol of rats was done by Ronnet et al (1995) and is suggested by him that rice bran lowers plasma and liver cholesterol than wheat bran. Barley bran flour or barley oil has similar effects on plasma cholesterol levels (Lupton et al, 1994)

Srinivasan and Shanmugasundaram (1990) validated that plant protein diets decreased coronary risk indices and prevented plasma lipid increase. Hence he suggested that replacement of dietary animal proteins by plant proteins would give better results in lowering the incidence of coronary heart disease than would diet restricted in fats.

Narshatsky, et al (1994) emphasised that eating garlic in an amount approximating on half to one clove per day decreased levels of total serum cholesterol to about 9%.

Giri et al (1994) illustrated that ginger is definitely anti-hypercholesterolaemic but needs to be taken daily for several days to obtain significant results. It has no immediate effect on serum cholesterol.

Losonczy, et al (1996) imparted that use of the antioxidant supplements, vitamin E along with vitamin C, may reduce the risk of all cause and coronary heart disease.

Rubennowitz (1996) revealed that magnesium in drinking water is an important protective factor for death from acute myocardial infarction among men.

Ueda (1996) proved that high levels of soyabean saponin have a potentially hypocholesterolaemic effect in cholesterol fed chicks.

Rapola (1996) suggested that supplementation of alpha tocopherol 150 mg/day was associated with a small decrease in the incidence of anginapectoris.

Gillum, et al (1996) explicated that white women who consumed fish more than once a week had significantly lower stroke incidence than those who never consumed fish.

Rimm, et al (1996) corroborated that there is an inverse association between fibre intake and myocardial infarction. It is suggested by him that fibre (vegetable, fruit and cereal) independent of fat intake is an important dietary component for the prevention of coronary disease. Lipsky and Gloger (1992) validated that soluble fibre psyllium can decrease blood cholesterol by about 15% but only with 10.2 g/day, and is supported by Ganji et al (1996). It has been shown to lower total serum and LDL-C concentrations in chicks (Davidson, 1996).

Suri, et al authenticated that guar-gum supplementation resulted in marked decrease in the level of total cholesterol, LDL and triglyceride and the mean drop being 36 mg/dl, 30.4 mg/dl and 29.3 mg/dl respectively. The HDL increased by 2.6 mg/dl on an average.

Methodology

III METHODOLOGY

The procedure followed for the study on "Incidence of cardiovascular risk factors among the selected adult population consuming different fats and oils" consists of the following steps :

A. Selection of the area

B. Selection of the sample

C. Collection of data using a questionnaire

D. Measurement of height and weight and waist and hip circumferences

E. 24 hour recall survey

F. Analysis of serum lipid profile

A. SELECTION OF THE AREA.

The study on incidence of cardiovascular diseases among adult population was conducted in both urban and rural areas of Coimbatore city based on the fat and oil consumption pattern. In rural areas the groundnut oil and coconut oil were produced and hence that formed the main cooking oil in their diet. So three villages namely Nagrajapuram, Vedapatti and Thaliyur were selected where consumption of groundnut oil was common. Thondamuthur and Devarayapuram were the other two villages selected where coconut oil was commonly used. Racecourse, Rathinapuri and Goundampalayam were the urban areas selected where the adults consumed oils like refined oil, sunflower oil and gingelly oil.

In order to understand the relationship between fat and oil consumption and incidence of cardiovascular diseases four major hospitals in Coimbatore city namely K.G, KMCH, Kuppusamy Naidu and Ramakrishna were selected as they extended co-operation to conduct the study. These hospitals were provided with separate cardiac departments and registered patients in large numbers to ease the conduct of the study.

B. SELECTION OF THE SAMPLE

In selecting the sample stratified random sampling was followed. First the various areas were stratified and then simple random sampling method was followed which involved selecting the sample just by a matter of chance and no involvement of personal bias.

Kothari (1990) stated that sample is small proportion of a population selected for the observation and analysis representing the population. A total sample of 402 adults both male and female in the age group of 20-60 years belonging to low, middle and high income group were selected in three villages at rural areas and three locations at urban areas.

A sub sample of 40 both male and female consisting of vegetarians and non-vegetarians consuming single oil as major item were selected for the analysis of serum lipid profile and it is shown in Table I.

TABLE I

GROUP AND SAMPLE SELECTED

GROUP	MAJOR OIL	No. OF SUB SAMPLE SELECTED			
		VEGETARIANS		NON-VEGETARIANS	
		MALE	FEMALE	MALE	FEMALE
I	Refined oil	2	2	2	2
II	Sunflower oil	2	2	2	2
III	Coconut oil	2	2	2	2
IV	Groundnut oil	2	2	2	2
V	Gingelly oil	2	2	2	2
VI	Mixture of oil	2	2	2	2

In hospitals the patients who were screened for cardiovascular diseases were selected. A total sample of 175 was selected during the period of 20 days observation each in KG and Kuppusamy Naidu hospital and 15 days each in KM H and Ramakrishna based on their willingness to co-operate in the study. The lipid-profile of the patients were noted from the case-sheet reports maintained by the hospitals.

C. COLLECTION OF DATA USING A QUESTIONNAIRE

A well framed questionnaire shown in Annexure I was used to collect the details of economic status, occupational status, life-style pattern, familial tendency, dietary pattern and consumption pattern of fat and oil. Using the questionnaire a direct personal interview method was followed and the data needed for the study was collected from all the selected samples.

Plate. 1 . Interview schedule

Hospital Survey

Domestic Survey

Gupta (1988), stated that an interview is a two way method which permits an exchange of ideas and information. The accuracy of the information collected was checked by including cross questions during the interview.

D. MEASUREMENT OF HEIGHT AND WEIGHT AND WAIST AND HIP CIRCUMFERENCES

Height and weight of all the selected samples were measured to find the Body Mass Index.

A greater mortality is reached with increase in body mass index (above 27.5) states Sorkin et al (1995).

The subjects were made to stand erect against the wall barefooted with their back and ankle touching the wall and using fibre glass tape the height was measured to the nearest of 0.5 cm. The weight was taken using a bathroom scale. The subjects were made to stand erect barefooted and with minimum clothing and the weight was measured to the nearest 0.5kg. The balance was checked each time before use.

The body mass index was calculated by using the formula

$$\frac{\text{Weight in kilograms}}{\text{Height in metre square}} = \text{Body Mass Index}$$

Plate. 2 . Recording the body measurements of the samples

HEIGHT

WEIGHT

WAIST CIRCUMFERENCE

HIP CIRCUMFERENCE

The waist circumference was measured with a fibre glass tape placed in a horizontal plane at the level of the natural waist line or narrowest part of the torso. The hip circumference was measured in the horizontal plane, at the level of maximal circumference, including the maximum extension of the buttocks posteriorly (Bray 1992).

The waist hip ratio was calculated using the formula

$$\frac{\text{Waist circumference in centimeters}}{\text{Hip circumference in centimeters}} = \text{Waist Hip Ratio}$$

Waist-hip ratio greater than 0.85 in women and 1.0 in men is predictive of increased risk for adverse metabolic consequences of obesity (Jensen, 1992).

E) TWENTY FOUR HOUR RECALL SURVEY

The regular dietary pattern of all the sample were collected by 24-hour recall method to understand their food and nutrient intake. Measuring cups and spoons were used to facilitate the subjects to quantify their food intake recalling what they ate for the past 24 hours. From this data the raw equivalents of the cooked foods were calculated to find out the food and nutrient intake.

The success of 24-hour recall method depends on the memory, co-operation and communication activity of the subjects and on the skill of the interviewer (Walter, 1990).

Information regarding fat and oil consumption pattern was also obtained. Details of the oil used for cooking, frequency of intake of fried foods, sweets, savouries and other oil rich foods were collected. Based on the details, the per capita consumption of oil was determined.

In case of cardiovascular disease patients, the details of the diet before and after the onset of the disease was collected to compute the role of diet in the disease.

F. ANALYSIS OF SERUM LIPID PROFILE

Kannel et al (1986) reported that blood lipids have been solidly established as fundamental to atherogenesis.

A total sub sample of 40, both male and female vegetarians and non-vegetarians categorized as overweight or obese were selected from all the 5 groups mentioned in Table I and their serum lipid profile : serum cholesterol, Triglyceride (TG), High density lipoportein cholesterol (HDL-C), Low density lipoprotein cholesterol (LDL-C) and very density lipoprotein cholesterol (VLDL-C) was estimated.

According to Knu-i-Man and West (1995) the concentrations of cholesterol in serum and various serum lipoprotein differs between the vegetarians and non-vegetarians.

CHOLESTEROL

The cholesterol level was estimated using orthokit method. Garber et al (1996) reported that screening for total serum cholesterol levels is most likely to be useful in populations at high risk for dying of coronary heart disease.

TRIGLYCERIDE

GPO-PAP method was used to estimate triglyceride (TG) level. Bass et al (1994) showed that levels of triglyceride is an independent lipid predictor of cardiovascular disease death.

HIGH DENSITY LIPOPROTEIN CHOLESTEROL

The high density lipoprotein cholesterol (HDL-C) was estimated using Ethnotest method. Jose et al 1996 highlighted that high levels of HDL-C reduce the risk of coronary heart disease.

The detailed procedures followed for the estimation of Triglyceride, total cholesterol and (HDL-C) is shown in Annexure II.

LDL-C and VLDL-C levels were computed using the formula given by Friedwald et al (1972).

$$\text{LDL-C} = \text{Total Cholesterol} - (\text{TG}/5) - \text{HDL.C}$$

$$\text{VLDL-C} = \text{Total Cholesterol} - (\text{LDL-C} + \text{HDL.C})$$

Results and Discussion

IV RESULTS AND DISCUSSION

The results and discussion of the study on "Incidence of cardiovascular risk factors among the selected adult population consuming different fats and oils", are presented under the following headings :

A. Back ground information of the selected samples.
B. Comparison of body mass index and waist-hip ratio among the selected groups.
C. Life style pattern of the selected samples.
D. Risk factors and cardiovascular disease among the samples.
E. Dietary pattern of the samples and
F. Serum lipid profile in relation to the type of fat intake

A. BACKGROUND INFORMATION OF THE SELECTED SAMPLE.

1. AGE AND SEX DISTRIBUTION

Details of the age and sex of the selected samples are furnished in Table I (Fig.1).

TABLE I

CLASSIFICATION OF THE SUBJECTS ACCORDING TO AGE AND SEX

OUPS	SAMPLES	SEX	AGE IN YEARS				
			20 -30 NO %	30-40 NO %	40-50 NO %	50-60 NO %	60-70 NO %
I	D N:103	M F	NIL NIL 4 3.9	5 4.9 48 46.6	20 19.4 25 24.3	NIL NIL 1 0.9	NIL NIL NIL NIL
	H N:51	M F	1 1.9 NIL NIL	2 3.9 2 3.9	18 35.3 2 3.9	5 9.8 12 23.5	7 13.7 2 3.9
II	D N: 93	M F	3 3.3 10 10.6	16 17.2 23 24.7	23 24.6 17 18.3	1 1.1 NIL NIL	NIL NIL NIL NIL
	H N: 73	M F	NIL NIL NIL NIL	3 4.1 2 2.7	17 23.3 13 17.8	5 6.8 12 16.4	6 8.2 15 20.5
III	D N: 32	M F	1 3.2 NIL NIL	5 15.6 8 25	6 18.8 9 28.1	NIL NIL 3 9.4	NIL NIL NIL NIL
	H N: 14	M F	NIL NIL NIL NIL	1 7.1 NIL NIL	6 42.9 NIL NIL	2 14.2 4 28.6	NIL NIL 1 7.1
IV	D N:123	M F	3 2.4 13 10.5	22 17.8 41 33.3	12 9.7 32 26	NIL NIL NIL NIL	NIL NIL NIL NIL
	H N: 25	M F	2 8 NIL NIL	1 4 2 8	2 8 1 4	4 16 6 24	2 8 5 20
V	D N: 15	M F	NIL NIL 2 13.3	4 26.6 4 26.6	2 13.3 3 20	NIL NIL NIL NIL	NIL NIL NIL NIL
	H N: 12	M F	NIL NIL NIL NIL	2 3.9 NIL NIL	2 3.9 1 8.3	12 23.5 1 8.3	2 3.9 5 41.6
VI	D N: 36	M F	4 11.1 8 22.2	2 5.5 3 8.3	4 11.1 9 25	6 16.6 NIL NIL	NIL NIL NIL NIL
	H N: NIL	M F	NIL NIL NIL NIL	NIL NIL NIL NIL	NIL NIL NIL NIL	NIL NIL NIL NIL	NIL NIL NIL NIL

Group I - Refined oil

Group II - Sunflower oil

Group III - Coconut oil

Group IV - Groundnut oil

Group V - Gingelly oil

Group VI - Mixture of oils

D - Domestic survey

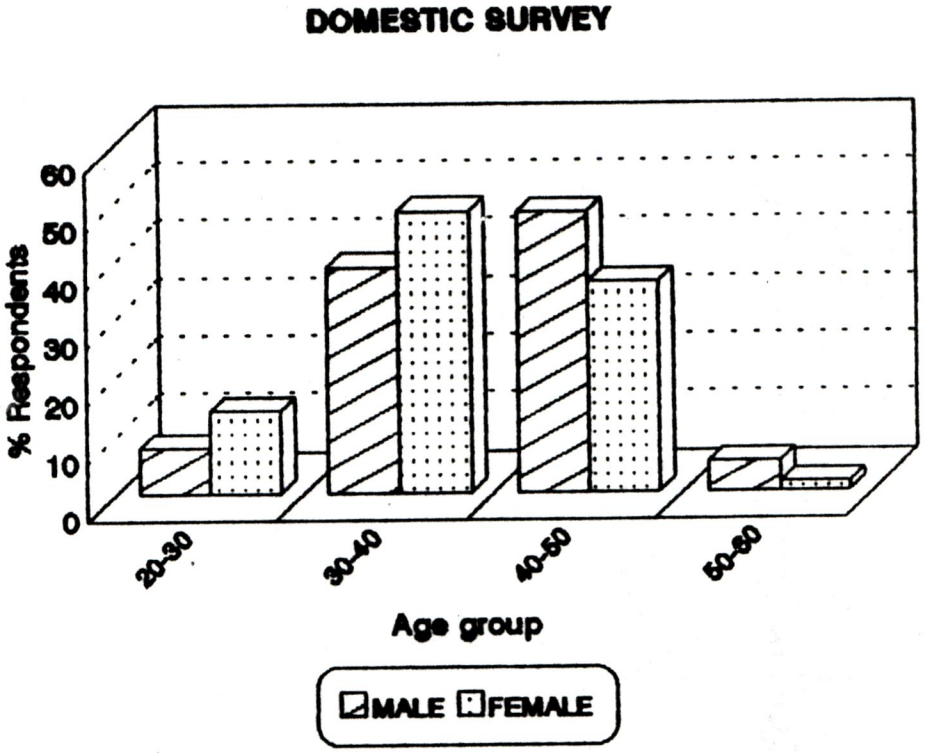
H - Hospital survey

M - Male

F - Female

* Group VI was absent in Hospital survey

CLASSIFICATION OF SUBJECTS ACCORDING TO THEIR AGE AND SEX



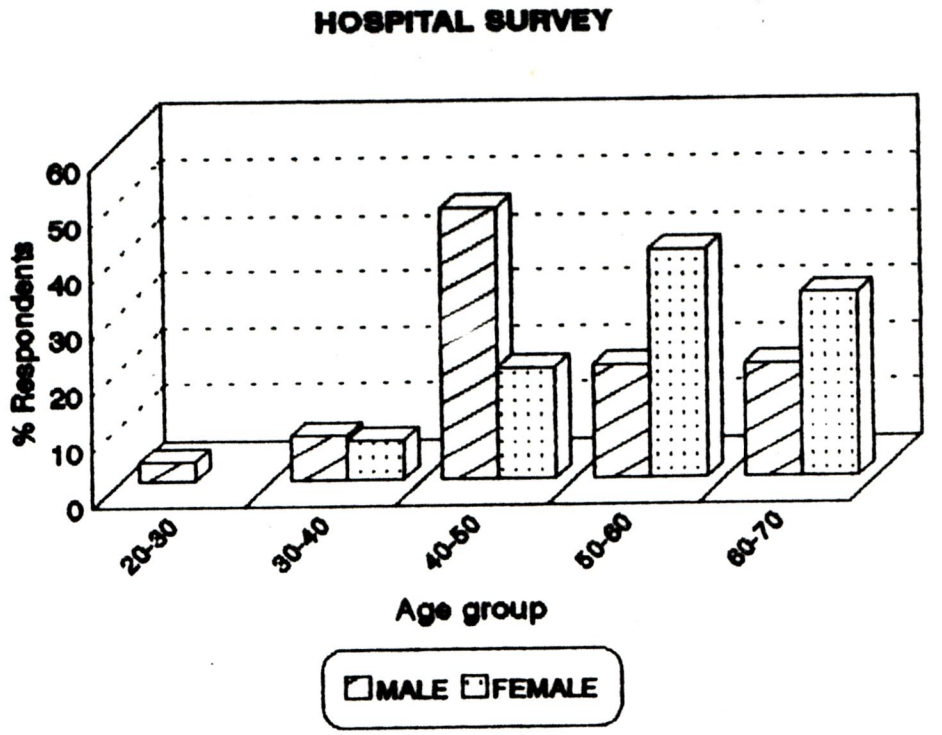


FIGURE - 1

As is evident from Table I, the age of patients who were selected for the present study ranged from 20-70 years. However the majority of the samples consisting of 181 (49.5%) belonged to the age group of 30-40 years in domestic survey and in case of hospital survey 60 (34.3%) belonged to the age group of 40-50 years and is shown in Figure 1. Belessey (1985) reported that advancing age has been a known risk factor for coronary heart disease.

2. EDUCATIONAL STATUS

The educational status of the selected samples is depicted in Table II.

TABLE II

EDUCATIONAL STATUS OF THE SELECTED SAMPLES

GROUPS	SAMPLES	ILLITRATE		PRIMARY SCHOOL		SECONDARY SCHOOL		UG		PG	
		No.	%	No.	%	No.	%	No.	%	No.	%
I	D N:103	6	5.8	12	11.6	21	20.4	53	51.5	11	10.7
	H N:51	NIL	NIL	15	29.4	16	31.4	15	29.4	NIL	NIL
II	D N:93	3	3.2	12	2.9	29	31.2	35	37.7	14	NIL
	H N:73	NIL	NIL	14	19.2	12	16.4	35	47.9	12	16.4
III	D N:32	10	31.3	8	25	5	15.6	6	18.8	3	9.4
	H N:14	NIL	NIL	2	14.3	10	71.4	1	7.1	1	7.1
IV	D N:123	61	49.6	31	25.2	27	21.9	4	3.3	NIL	NIL
	H N:25	NIL	NIL	12	48	2	8	9	36	2	8
V	D N:15	1	6.6	6	40	4	26.6	3	20	1	6.6
	H N:12	NIL	NIL	4	33.3	3	25	4	33.3	1	8.3
VI	D N:36	NIL	NIL	8	22.2	9	25	11	30.5	8	22.2

UG - Under graduate
PG - Post graduate

From Table II it is clear that 49.6% of the illiterate sample belonged to Group II who were selected from rural areas. Majority of the undergraduates (21.9%) and post graduates (6.2%) were seen in urban areas in Group I and Group II. In case of hospital survey it is deciphered that illiteracy was absent among them and it is attributed to the fact that they belonged to urban areas.

3. OCCUPATIONAL STATUS

The following Table II (Fig. 2) shows the occupation and activity pattern of the selected sujects.

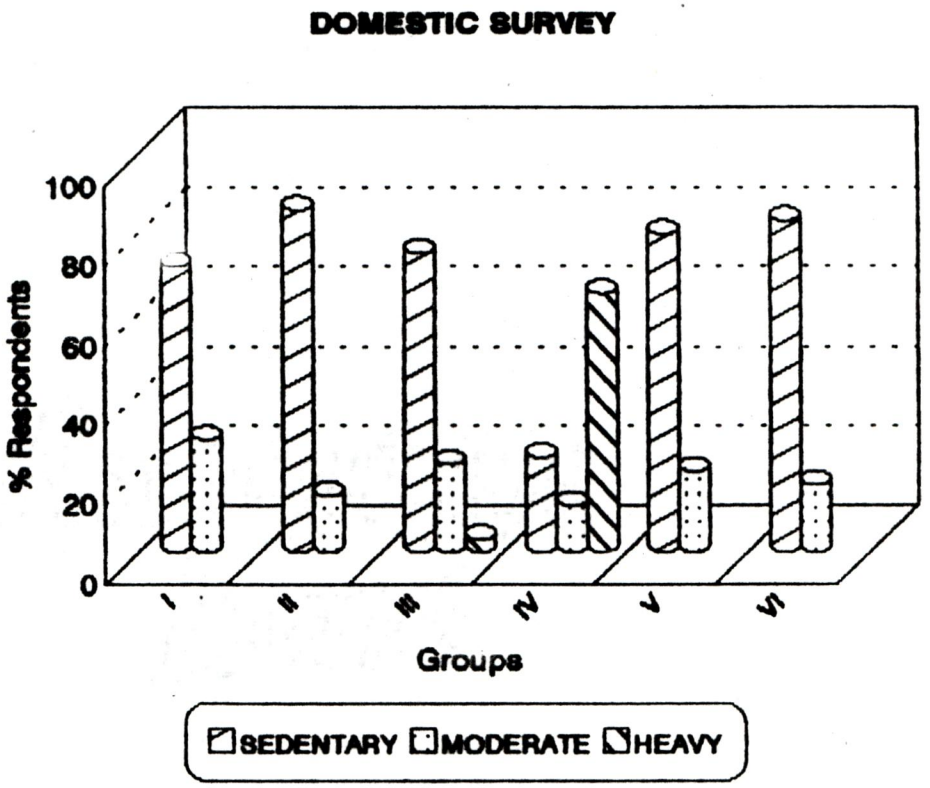
TABLE II

OCCUPATIONAL STATUS OF THE SELECTED SUBJECTS

GROUPS	SAMPLES	SEX	SEDENTARY						MODERATE				HEAVY			OTHERS
			B		O		H		P		A		M			
			NO	%	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
I	D	M	5	4.8	11	10.6	NIL	NIL	8	7.8	1	0.9	NIL	NIL	1	0.9
	N.103	F	NIL	NIL	8	7.8	50	48.5	15	14.7	NIL	NIL	NIL	NIL	4	3.8
	H	M	19	37.3	3	5.8	NIL	NIL	4	7.8	2	3.9	3	5.8	2	3.9
	N.51	F	NIL	NIL	1	1.9	16	31.3	1	1.9	NIL	NIL	NIL	NIL	NIL	NIL
II	D	M	24	25.8	11	11.8	NIL	NIL	4	4.3	NIL	NIL	NIL	NIL	3	3.2
	N.93	F	NIL	NIL	1	1.1	44	47.3	2	2.2	NIL	NIL	NIL	NIL	4	4.3
	H	M	17	23.2	9	12.3	NIL	NIL	1	1.4	1	1.4	2	2.7	1	1.4
	N.73	F	NIL	NIL	4	5.4	34	46.5	NIL	NIL	NIL	NIL	NIL	NIL	4	5.4
III	D	M	1	3.1	3	9.4	NIL	NIL	NIL	NIL	7	7.5	1	1.1	NIL	NIL
	N.32	F	NIL	NIL	NIL	NIL	20	62.5	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
	H	M	NIL	NIL	3	21.4	NIL	NIL	NIL	NIL	5	35.7	NIL	NIL	1	7.1
	N.14	F	NIL	NIL	NIL	NIL	5	35.7	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
IV	D	M	1	0.8	1	0.8	NIL	NIL	2	1.6	10	8.1	21	17.1	2	1.6
	N.123	F	NIL	NIL	NIL	NIL	27	21.9	NIL	NIL	NIL	NIL	59	47.9	NIL	NIL
	H	M	NIL	NIL	1	4	NIL	NIL	1	4	6	24	3	12	NIL	NIL
	N.25	F	NIL	NIL	NIL	NIL	13	52	NIL	NIL	NIL	NIL	1	4	NIL	NIL
V	D	M	1	6.6	3	20	NIL	NIL	NIL	NIL	1	6.6	NIL	NIL	1	6.6
	NO.15	F	NIL	NIL	NIL	NIL	8	53.3	1	6.6	NIL	NIL	NIL	NIL	NIL	NIL
	H	M	1	8.3	3	25	NIL	NIL	1	8.3	NIL	NIL	NIL	NIL	NIL	NIL
	N.12	F	NIL	NIL	NIL	NIL	7	58.3	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
VI	D	M	3	8.3	7	19.4	NIL	NIL	1	2.7	NIL	NIL	3	8.3	2	5.5
	N.36	F	NIL	NIL	1	2.7	19	52.8	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

B-Busisness, O-Officer, H- Housewife, P- professionals, A- Agriculture, M- Manual

ACTIVITY PATTERN OF THE SELECTED SUBJECTS



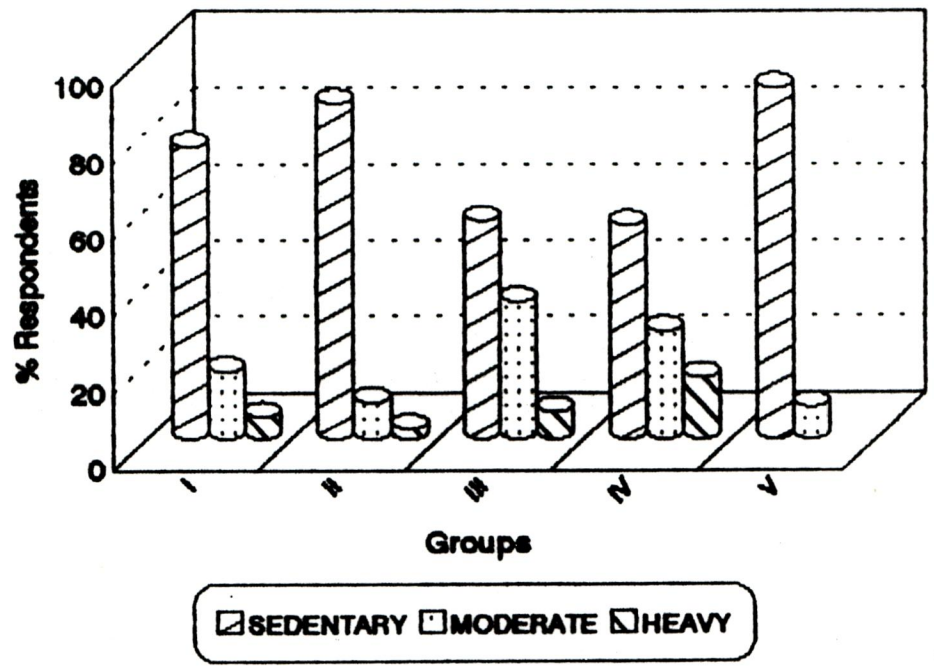


FIGURE - 2

It is notable from Table III that among the selected subjects in domestic survey 22.4% (7.7% male and 14.7% female) were heavy activity persons belonging to Group IV. It is authenticated that 77.7% (32% male and 45.7% female) of the cardiovascular disease patients belonged to sedentary activity group and this may be a risk factor for the onset of the disease. The occupation under heavy activity included manual labourers under moderate activity included agriculturist and professionals and the others in moderate activity were carpenter, cameraman, electrician, driver, fitter and weaver.

4.INCOME LEVEL :

Table IV figures out the income level of the selected subjects.

TABLE IV

INCOME LEVEL OF THE SELECTED SUBJECTS

GROUPS	SAMPLES	INCOME					
		< 2000		2000 - 5000		> 5000	
		No.	%	No.	%	No.	%
I	D N:103	12	11.6	43	41.1	48	46.6
	H N:51	5	9.8	15	29.4	31	60.8
II	D N:93	1	1.1	9	9.7	83	89.3
	H N:73	2	2.7	18	24.7	53	72.6
III	D N:52	NIL	NIL	7	21.8	25	78.1
	H N:14	NIL	NIL	1	7.1	13	92.9
IV	D N:123	83	67.5	16	13.0	24	19.5
	H N:25	9	36	4	16	12	48
V	D N:15	2	13.3	9	60	4	26.6
	H N:12	1	8.3	2	16.6	9	75
VI	D N:36	2	5.5	16	44.4	18	50

Table IV reveals that out of 184, 131 (71.2%) in Group I and Group II belonged to high income group while among the 98 sample, in Group IV 83 belonged to low income. The majority (67.41) of the patients in hospitals belonged to high income group.

5. FOOD EXPENDITURE PATTERN :

It is evident from the study that 126 (31.3%) of the 402 samples spent 50-60% of their expenditure on food with 19.9% being dominated by Group V who belonged to low income group. 45% spent 30-50% on food in Group II in domestic survey. It was seen that 66.7% of the high income group spent very less (20-30%) on food the reason being that they cultivated and owned food items for their use. Of the 175 samples in hospital it was seen that 81.1% spent 30-50% on food and they belonged to high income group.

6. FAMILY HISTORY OF THE DISEASE.

Table V illustrates the pattern of familial tendency among the selected subjects.

TABLE V

FAMILY HISTORY OF THE DISEASE.

GROUPS	SAMPLES		DISEASE									
			M.I		IHD		H.T		STROKE		OTHERS	
			No.	%	No.	%	No.	%	No.	%	No.	%
I	D	GP	13	12.6	10	9.7	25	24.3	NIL	NIL	NIL	NIL
	N:103	P	12	11.7	3	2.9	5	4.9	NIL	NIL	5	4.9
	H	GP	8	15.7	1	1.9	10	19.6	NIL	NIL	NIL	NIL
	N:51	P	2	3.9	13	25.5	11	21.5	NIL	NIL	NIL	NIL
II	D	GP	18	19.4	3	3.3	2	2.2	1	1.1	1	1.1
	N:93	P	5	5.4	3	3.3	2	2.2	1	1.1	3	3.3
	H	GP	10	13.7	5	6.8	12	16.4	1	1.4	1	1.4
	N:73	P	4	5.5	9	12.3	14	19.2	NIL	NIL	NIL	NIL
III	D	GP	2	6.3	NIL	NIL	1	3.3	NIL	NIL	NIL	NIL
	N:32	P	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
	H	GP	1	7.1	NIL	NIL	3	21.4	NIL	NIL	NIL	NIL
	N:14	P	3	21.4	1	7.1	2	14.2	NIL	NIL	NIL	NIL
IV	D	GP	7	5.7	1	0.8	NIL	NIL	NIL	NIL	NIL	NIL
	N:123	P	NIL	NIL	NIL	NIL	5	4.1	1	0.8	2	16.3
	H	GP	1	2	NIL	NIL	5	20	NIL	NIL	NIL	NIL
	N:25	P	2	8	NIL	NIL	8	32	NIL	NIL	NIL	NIL
V	D	GP	2	13.3	NIL	NIL	1	6.6	NIL	NIL	NIL	NIL
	N:15	P	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
	H	GP	3	25	NIL	NIL	1	8.3	NIL	NIL	NIL	NIL
	N:12	P	NIL	NIL	1	8.3	8	66.6	NIL	NIL	NIL	NIL
VI	D	GP	4	11.1	NIL	NIL	3	8.3	1	2.7	NIL	NIL
	N:36	P	2	5.5	1	2.7	5	13.8	NIL	NIL	NIL	NIL

MI - Myocardial Infarction
IHD - Ischaemic Heart Disease
HT - Hypertension
GP - Grand Parents
P - Parents

Table V shows that 137 (78.3%) out of 175 cardiovascular disease patients had family history of the

disease. Group I and Group II had a higher family history of cardiovascular disease in both hospital and domestic survey (27.9% in domestic and 62.3% in hospital) than others and this can be substantiated that however after the diagnosis they switched over to refined oil and sunflower oil to control the disease. Vardan(1995) validated that a positive family history earlier, is and independent risk factor for coronary heart disease.

B. COMPARISON OF BODY MASS INDEX AND WAIST-HIP-RATIO AMONG THE SELECTED GROUPS

1. BODY MASS INDEX.

Table VI presents the body mass index of the selected subjects based on Garrow's classification.

TABLE VI

CLASSIFICATION OF SUBJECTS ACCORDING TO BODY MASS INDEX

GROUPS	SAMPLES	SEX	BODY MASS INDEX									
			17-18.5		18.5-20		20-25		25 30		>30	
			No.	%	No.	%	No.	%	No.	%	No.	%
I	D	M	2	1.9	8	7.7	3	2.9	9	8.7	3	2.9
	N:103	F	2	1.9	13	12.6	51	49.5	8	7.8	4	3.9
	H	M	5	9.8	2	3.9	7	13.7	14	27.5	5	9.8
	N:51	F	NIL	NIL	NIL	NIL	8	15.6	6	11.7	4	7.8
II	D	M	NIL	NIL	2	2.2	15	16.1	24	25.8	2	2.2
	N:93	F	2	2.2	5	5.4	23	24.7	17	18.3	3	3.2
	H	M	3	4.1	2	2.7	9	12.3	15	20.5	2	2.7
	N:73	F	NIL	NIL	3	4.1	23	31.5	14	19.1	2	2.7
III	D	M	NIL	NIL	1	3.1	5	15.6	3	9.4	1	3.1
	N:32	F	NIL	NIL	1	3.1	18	56.3	13	40.6	NIL	NIL
	H	M	4	28.5	1	7.1	NIL	NIL	2	14.2	2	14.2
	N:14	F	NIL	NIL	NIL	NIL	3	21.4	1	7.1	1	7.1
IV	D	M	3	2.4	12	9.8	17	13.8	4	3.2	1	0.8
	N:123	F	4	3.3	41	33.3	31	25.2	9	7.3	1	0.8
	H	M	4	16	5	20	1	4	1	4	NIL	NIL
	N:25	F	NIL	NIL	1	4	11	44	1	4	1	4
V	D	M	NIL	NIL	1	6.6	2	13.3	2	13.3	1	6.6
	N:15	F	NIL	NIL	NIL	NIL	4	26.6	4	26.6	NIL	NIL
	H	M	NIL	NIL	NIL	NIL	3	.25	2	16	NIL	NIL
	N:12	M	NIL	NIL	NIL	NIL	3	25	3	25	1	8.3
VI	D	M	NIL	NIL	1	2.7	9	25	2	5.5	4	11.1
	N:36	F	NIL	NIL	4	11.1	6	16.6	8	22.2	2	5.5

Body Mass Index **Grade**

17 - 18.5 - Chronic Energy Deficiency. Grade I (Mild)
18.5 - 20 - Low Weight
20 - 25 - Normal
25 - 30 - Obese. Grade I (Over weight)
>30 - Obese. Grade II

The above Table VI reveals that overweight was more prevalent (25.6%) than obesity (4.37%) in domestic samples and the same was noted in patients, in hospitals with 33.7% being overweight against 10.3% obesity. Tittarris (1988) accentuated that being overweight is a serious health problem for older individuals especially for those with long standing weight problems. It was seen that 40 persons (37.7%) of the 106 patients (9.4% male and 28.3% female)in domestic survey who were obese and overweight had hypertension and 44% (24.5% male and 19.4% female) in hospital survey experienced the onset of cardiovascular disease.

2. WAIST-HIP RATIO OF THE SELECTED SUBJECTS

Waist-hip ratio of the selected subjects is depicted in Table VII.

TABLE VII

CLASSIFICATION OF THE SUBJECTS ACCORDING TO WAIST-HIP RATIO(WHR)

GROUPS	SAMPLES	SEX	WHR					
			0.7 - 0.8		0.8 - 1.0		>1.0	
			No.	%	No.	%	No.	%
I	D	M	7	6.7	14	13.5	4	3.9
	N:103	F	52	50.5	24	23.3	2	1.9
	H	M	9	17.6	19	37.3	5	9.8
	N:51	F	12	23.5	4	7.8	2	3.9
II	D	M	16	17.2	24	25.8	3	3.2
	N:93	F	32	34.4	15	16.1	3	3.2
	H	M	4	5.4	21	41.2	6	8.2
	N:73	F	26	35.6	12	16.4	2	2.7
III	D	M	8	25	2	6.3	1	3.1
	N:32	F	14	43.8	7	21.9	NIL	NIL
	H	M	5	35.7	3	21.4	1	7.1
	N:14	F	NIL	NIL	4	28.5	1	7.1
IV	D	M	32	26	4	3.3	1	0.8
	N:123	F	76	61.8	10	8.1	NIL	NIL
	H	M	3	12	8	32	NIL	NIL
	N:25	F	9	36	5	20	NIL	NIL
V	D	M	2	13.3	3	20	1	6.6
	N:15	F	8	53.3	1	6.6	NIL	NIL
	H	M	3	25	2	16.6	NIL	NIL
	N:12	F	6	50	1	8.3	NIL	NIL
VI	D	M	2	5.5	10	27.7	4	11.1
	N:36	F	8	22.2	10	27.7	2	5.5

From Table VII it is clear that the waist hip ratio risk was more prevalent among women (30.1%) than men (11.4%).

According to Dentsh and Morrill (1993) WHR above 0.8 for women and 1.05 for men are prone to cardiovascular disease.

C. LIFE-STYLE OF THE PATTERN OF THE SELECTED SUBJECTS

Leaf (1991) proved that even in advanced stages the cardiovascular diseases can be reversed with suitable life-style changes.

1.EXERCISE PATTERN OF THE SELECTED SUBJECTS.

The type of exercise performed by the samples are shown in Table VIII.

TABLE VIII

TYPE OF EXERCISE PERFORMED BY THE SUBJECTS.

GROUPS	SAMPLES	SEX	EXERCISE									
			WALKING		JOGGING		YOGA		OTHERS		N-P	
			No.	%	No.	%	No.	%	No.	%	No.	%
I	D	M	8	7.7	3	2.9	2	1.9	1	0.9	11	10.6
	N:103	F	11	10.6	NIL	NIL	4	3.9	NIL	NIL	63	61.2
	H	M	13	25.9	4	7.8	2	3.9	NIL	NIL	14	27.5
	N:51	F	14	27.5	NIL	NIL	NIL	NIL	NIL	NIL	4	7.8
II	D	M	23	24.7	4	4.3	4	4.3	3	3.2	9	9.6
	N:93	F	21	22.5	NIL	NIL	2	2.2	NIL	NIL	27	29
	H	M	28	38.4	2	2.7	NIL	NIL	NIL	NIL	1	1.4
	N:73	F	15	20.5	NIL	NIL	3	4.1	2	2.7	22	30.1
III	D	M	1	3.1	1	3.1	NIL	NIL	NIL	NIL	10	31.3
	N:32	F	3	9.4	NIL	NIL	1	3.1	NIL	NIL	16	15
	H	M	8	57.1	1	7.1	NIL	NIL	NIL	NIL	NIL	NIL
	N:14	F	3	21.4	NIL	NIL	NIL	NIL	NIL	NIL	2	14.3
IV	D	M	NIL	NIL	NIL	NIL	NIL	NIL	29	23.6	8	6.5
	N:123	F	10	8.1	NIL	NIL	NIL	NIL	NIL	NIL	76	61.7
	H	M	3	12	NIL	NIL	NIL	NIL	1	4	7	28
	N:25	F	2	8	NIL	NIL	NIL	NIL	NIL	NIL	12	48
V	D	M	1	6.6	NIL	NIL	NIL	NIL	2	13.2	3	20
	N:15	F	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	9	16
	H	M	3	25	NIL	NIL	1	8.3	NIL	NIL	1	8.3
	N:12	F	5	41.6	NIL	NIL	1	8.3	NIL	NIL	1	8.3
VI	D	M	2	5.5	1	2.7	1	2.7	1	2.7	11	30.5
	N:36	F	1	2.7	NIL	NIL	NIL	NIL	NIL	NIL	19	52.8

N-P : NON PERFORMERS

The above Table VIII shows that exercise was performed by the cardiovascular disease patients more than the subjects selected from the domestic survey. It was seen that 63.4% (33.7% male and 25.7% female) patients in hospitals performed different types of exercise against 34.3% (21.7% male and 12.7% female) selected from both urban and rural areas. Johnson (1994) opines that lack of physical exercise is more often the cause of overweight than is over eating and becomes one of the cause of cardiovascular disease.

2. TOBACCO CHEWING HABIT OF THE SELECTED SUBJECTS.

The study revealed that the practice of chewing tobacco was seen in rural areas and not in urban areas. It was confirmed by the fact that of the 402 selected samples, 46 female had the habit of chewing tobacco and they belonged to rural areas with 6.5% belonging to Group III and 93.5% to Group IV. The incidence of myocardial infarction had occurred in 5 female patients (2.8%) who had the habit of chewing tobacco.

Martins et al (1996) brought about a positive correlation between tobacco chewing and lipaemic disorders and Altman (1997) accentuate that giving up tobacco accounted for 3% decline in cardiovascular deaths and improvement in lipoprotein level was 16%.

3. SMOKING PATTERN OF THE SELECTED SAMPLES.

It was studied that 56.8% of the male subjects form domestic survey had the habit of smoking. As is true of the proverb "Habits die hard" it is evident from the present study that even after the onset of the disease 35.9% had the habit of smoking. Victor (1993) corroborated that there is no doubt that smoking predisposes to coronary artery disease.

3.a. EX-SMOKERS AMONG THE SELECTED SUBJECTS.

It was studied that only 23.6% of patients quitted smoking after the incidence. While it was not seen among others. Altman (1997) reported that as a preventive step among those who had already developed coronary artery disease, stopping smoking accounted for a four per cent decline in the number of deaths and the improvement in lipoprotein levels accounted for 18%.

4. ALCOHOL CONSUMPTION PATTERN

Brandy and Whisky were the popularly consumed alcohol. The study points out that 39.6% and 20.2 % of the domestic subjects and patients from hospital consumed alcohol respectively. Among them, 21.4% were ex-alcoholics who stopped consuming it after the onset of the disease. The quantity of intake ranged from 50-100ml among the patients while in domestic subjects it ranged from 50 to 1000 ml. Mayer et al (1997) showed that there is an inverse relationship between alcohol intake the coronary artery disease. Alcohol adds empty calories and promote obesity.

5. CONSUMPTION PATTERN OF BEVERAGES

Table IX furnishes the details of beverage intake among the selected subjects.

TABLE IX
CLASSIFICATION OF SUBJECTS ACCORDING TO BEVERAGE INTAKE

GROUPS	SAMPLES	BEVERAGES									
		COFFEE		TEA		BOTH		MILK		NIL	
		No.	%	No.	%	No.	%	No.	%	No.	%
I	D N:103	52	50.5	33	32	5	4.9	6	5.8	7	6.8
	H N:51	7	13.7	25	49	3	5.8	4	7.8	12	23.5
II	D N:93	51	54.8	34	36.5	2	2.2	6	6.5	NIL	NIL
	H N:73	14	19.2	39	53.4	1	1.4	11	15.1	8	10.9
III	D N:32	5	15.6	24	75	NIL	NIL	1	3.1	2	6.3
	H N:14	2	14.2	6	42.8	NIL	NIL	4	28.5	2	14.2
IV	D N:123	6	4.8	112	91	NIL	NIL	2	1.6	3	2.4
	H N:25	NIL	NIL	21	84	NIL	NIL	3	12	1	4
V	D N:15	3	20	9	60	2	13.3	1	6.6	NIL	NIL
	H N:12	2	16.6	4	33.3	NIL	NIL	3	25	3	25
VI	D N:36	8	22.2	17	47.2	1	2.7	4	11.1	2	5.5

The Table IX figures out that consumption of tea was high among both domestic (56.9%) and hospital subjects

(54.3%). Coffee consumption was high (31.1%) among the domestic subjects as against only 14.3% among cardiovascular patients since doctors had advised them to stop it. Totaly the milk consumption was seen among 5-14% of the subjects.

5.a. COFFEE CONSUMPTION PATTERN BEFORE THE ONSET OF THE DISEASE.

Pillay (1996) established that excessive Caffeine intake will have serious ramifications on cardiac system, and hence the patients consumed less amount after the onset of the disease. It was studied that 23.4% consumed 3 cups of coffee, 16.6% 4 cups, 17.6% 5 cups and 17.3% more than 5 cups of coffee before the onset of the disease in both domestic and hospital survey patients.

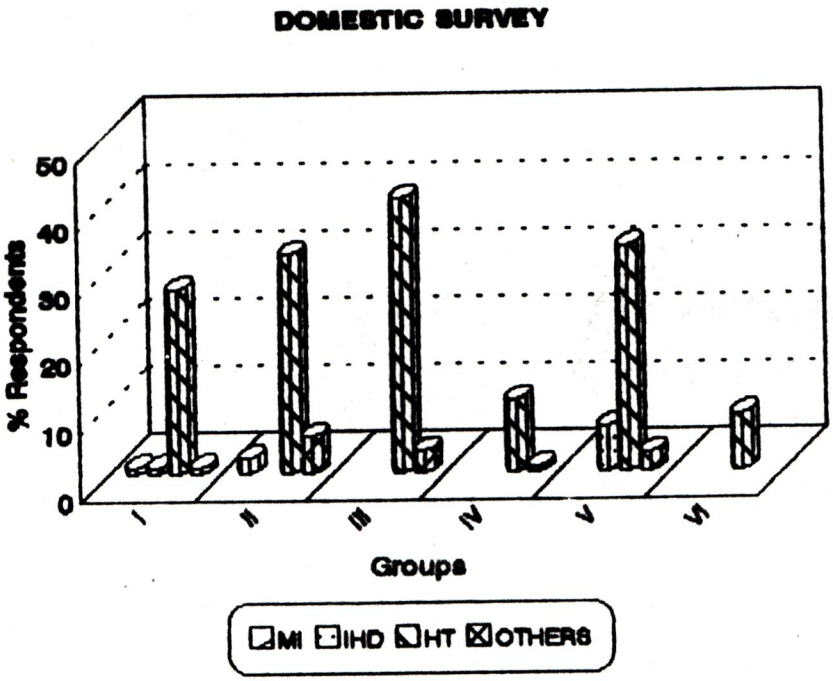
D. RISK FACTORS AND CARDIOVASCULAR DISEASE AMONG THE SELECTED SUBJECTS

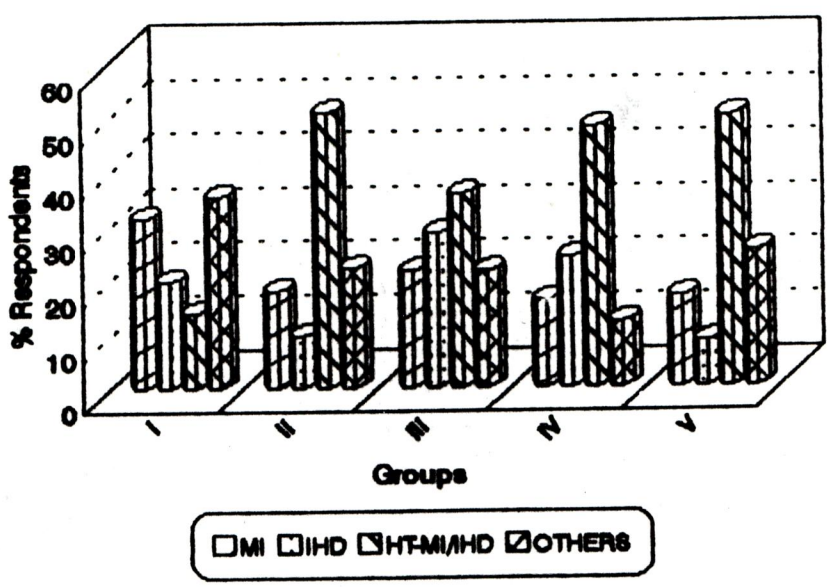
As seen in the review that incidence of cardiovascular disease in India and the world is life threatening. the forthcoming tables show the incidence of the cardiovascular disease and the risk factors responsible for the type of heart disease being suffered by the selected subjects.

1. CARDIOVASCULAR DISEASE INCIDENCE AMONG THE SELECTED SUBJECTS

Table X (Fig.3) reveals the type of heart disease condition of the selected subjects.

TYPE OF HEART DISEASE CONDITION OF THE SELECTED SUBJECTS





MI - MYOCARDIAL INFARCTION
IHD - ISCHAEMIC HEART DISEASE
HT - HYPERTENSION

FIGURE – 3

TABLE - X

TYPE OF HEART DISEASE CONDITION OF THE SELECTED SUBJECTS

Groups	Sample	Sex	MI		IHD		HT		HT/MI/IHD		AP		RHD		CAD		OTHERS	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
I	D	M	1	0.9	---	---	14	13.5	Nil	Nil	---	---	---	---	---	---	1	0.9
		F	---	---	1	0.9	14	13.5	---	---	---	---	---	---	---	---	---	---
	H	M	14	27.4	6	11.7	---	---	5	9.8	3	5.8	1	1.9	4	7.9	---	---
		F	2	3.9	4	7.8	---	---	2	3.9	1	1.9	4	7.9	---	---	5	9.8
II	D	M	2	21	---	---	10	10.7	---	---	---	---	---	---	---	---	3	3.2
		F	---	---	---	---	20	21.5	---	---	---	---	2	2.1	---	---	---	---
	H	M	7	9.5	2	2.7	---	---	18	24.6	2	2.7	---	---	---	---	2	2.7
		F	12	16.4	5	6.8	---	---	19	26	4	5.4	---	---	---	---	2	2.7
III	D	M	---	---	---	---	5	15.6	---	---	---	---	---	---	---	---	1	3.1
		F	---	---	---	---	8	25	---	---	---	---	---	---	---	---	---	---
	H	M	3	27.4	1	7.1	---	---	3	21.4	---	---	---	---	1	7.1	1	7.1
		F	---	---	3	2.4	---	---	2	14.2	---	---	---	---	---	---	---	---
IV	D	M	---	---	---	---	6	4.8	---	---	---	---	---	---	---	---	---	---
		F	---	---	---	---	7	5.6	---	---	---	---	1	0.8	---	---	---	---
	H	M	3	12	4	16	---	---	4	16	---	---	---	---	---	---	---	---
		F	1	4	2	8	---	---	8	32	---	---	2	8	---	---	1	4
V	D	M	---	---	---	---	1	6.6	3	20	---	---	---	---	---	---	---	---
		F	---	---	---	---	2	13.3	---	---	---	---	---	---	---	---	---	---
	H	M	2	16.6	1	8.3	---	---	4	33.3	---	---	---	---	1	8.3	---	---
		F	1	8.3	---	---	---	---	2	16.1	---	---	1	8.3	---	---	---	---
VI	D	M	---	---	---	---	1	2.7	---	---	---	---	---	---	---	---	---	---
		F	---	---	---	---	2	5.5	---	---	1	5.5	---	---	---	---	---	---
	H	M	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		F	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

MI - Myocardial Infarction, IHD - Ischaemic Heart Disease, HT - Hypertension, AP - Angina Pectoris, RHD - Rheumatic Heart Disease, CAD - Coronary Artery Disease .

The above Table X shows that 22.9% (9.7% male and 13.2% female) of the 402 selected subjects suffered from hypertension. Among them 32.6% were from Group II, 30.4% from Group I who belong to high income group and hence have the habit of taking rich foods like fried foods & bakery items and leading a sedentary life which was an important cause for the onset of disease. 14.1% were from Group III and IV.

Among the 175 patients from hospitals, 38.2% (19.4% male and 18.8% female) suffer from myocardial infarction or ischaemic heart disease along with hypertension. It is pursued from the Table X that 39.1% of the incidence was seen in Group II, 20.2% in Group I and 13.9% in Group IV.

2. RISK FACTORS RESPONSIBLE FOR THE INCIDENCE OF CARDIOVASCULAR DISEASE AMONG THE SELECTED SAMPLES.

The following Table XI (Fig.5) depicts the risk factors responsible for the onset of the disease.

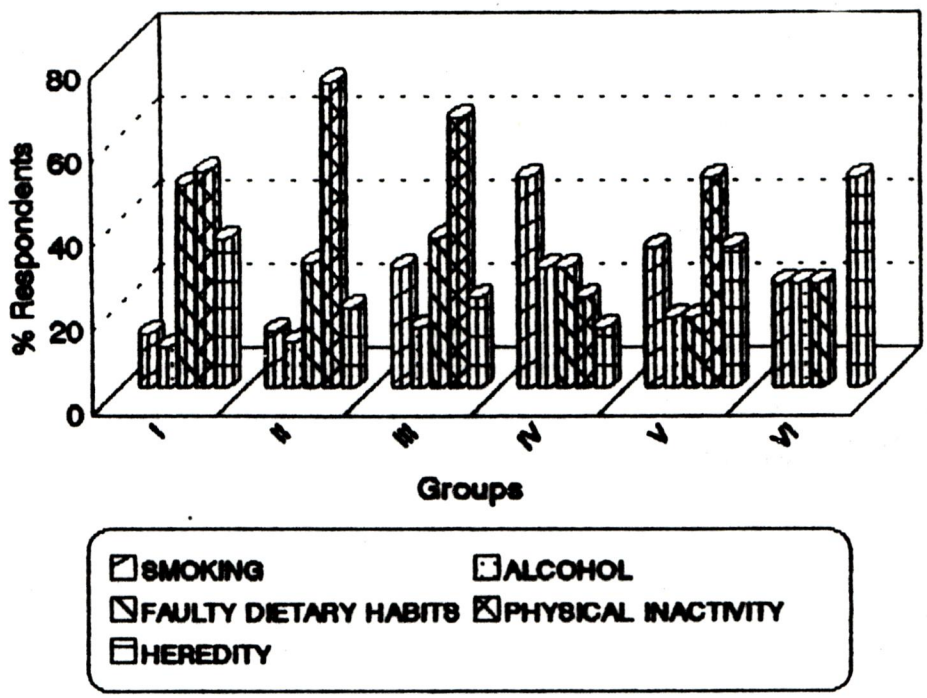
TABLE XI

RISK FACTORS ACCOUNTING FOR THE INCIDENCE OF CARDIOVASCULAR DISEASE

GROUPS	SAMPLES	SEX	RISK FACTORS									
			SMOKING		ALCOHOL		FAULTY DIETARY HABITS		PHYSICAL INACTIVITY		HEREDITY	
			No.	%	No.	%	No.	%	No.	%	No.	%
I	D	M	4	12.9	3	9.7	8	25.8	1	6.1	5	16.1
	N:31	F	NIL	NIL	NIL	NIL	7	22.6	11	35.4	6	19.3
	H	M	16	31.3	10	19.6	10	19.6	14	27.5	22	43.1
	N:51	F	NIL	NIL	NIL	NIL	9	17.6	4	7.8	23	45.1
II	D	M	5	13.5	4	10.8	5	13.5	9	24.3	4	57.1
	N:37	F	NIL	NIL	NIL	NIL	6	16.2	18	48.6	3	8.1
	H	M	16	21.9	19	26	12	16.4	1	1.3	38	52
	N:73	F	NIL	NIL	NIL	NIL	10	13.7	22	30.1	18	24.7
III	D	M	4	28.6	2	14.3	2	14.3	4	28.6	1	7.1
	N:14	F	NIL	NIL	NIL	NIL	3	21.4	5	35.7	2	14.2
	H	M	3	21.4	4	28.6	4	28.6	NIL	NIL	2	14.2
	N:14	F	NIL	NIL	NIL	NIL	4	28.6	2	14.2	8	57.1
IV	D	M	7	50	4	28.6	2	14.2	2	14.2	1	7.1
	N:14	F	NIL	NIL	NIL	NIL	2	14.2	1	7.1	1	7.1
	H	M	3	12	9	36	5	20	7	23	8	32
	N:25	F	NIL	NIL	NIL	NIL	7	28	12	48	8	32
V	D	M	2	33.3	1	16.6	NIL	NIL	1	16.6	1	16.6
	N:6	F	NIL	NIL	NIL	NIL	1	16.6	2	33.3	1	16.6
	H	M	7	58.3	NIL	NIL	1	16.6	1	8.3	7	58.3
	N:12	F	NIL	NIL	NIL	NIL	4	33.3	1	8.3	6	50
VI	D	M	1	25	1	25	NIL	NIL	NIL	NIL	1	25
	N:4	F	NIL	NIL	NIL	NIL	1	25	NIL	NIL	1	25

RISK FACTORS ACCCOUNTING FOR THE ONSET OF THE DISEASE

DOMESTIC SURVEY



HOSPITAL SURVEY

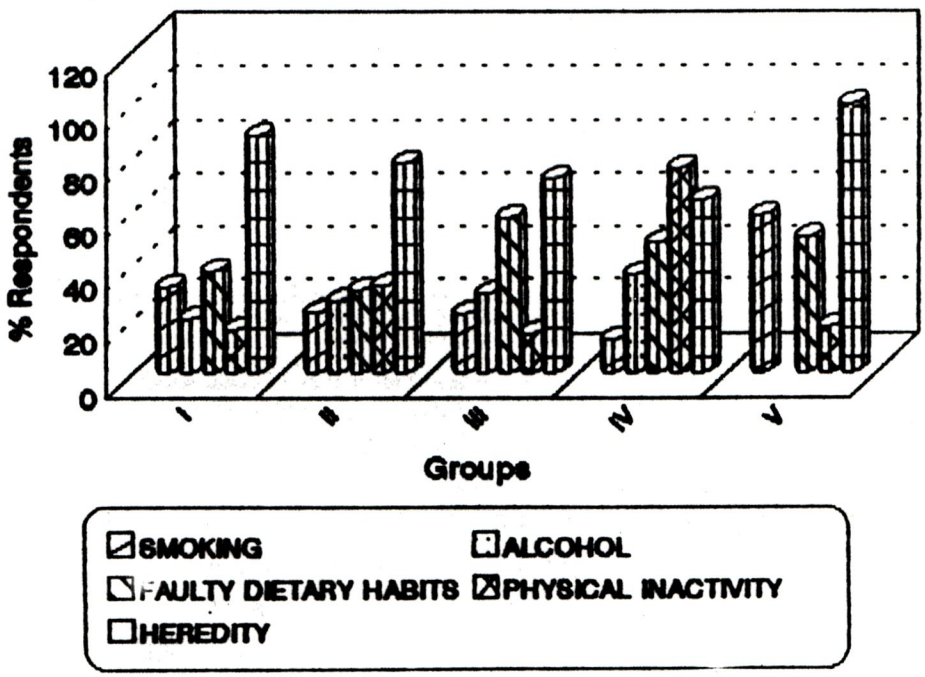


FIGURE – 5

It is pursued from Table XI that of the 13.7 males affected by the disease 124 (90.5%) had the habit of smoking (49.6%) and consuming alcohol (40.9%). Faulty dietary habits like consuming high amount of coffee, calories and saturated fat were seen in 37% (17.8% male and 19.2% female) of the patients. Physical inactivity another important risk factor was seen in 43.4% (15.7% of male and 27.7% female) of the patients. Heredity of the disease was seen in 59.4% (32.0% male and 27.4% female) of the patients.

3. AGE OF ONSET OF THE DISEASE.

The pattern of age of onset of the disease among the cardiovascular disease patients is shows in Table XII.(Fig.4)

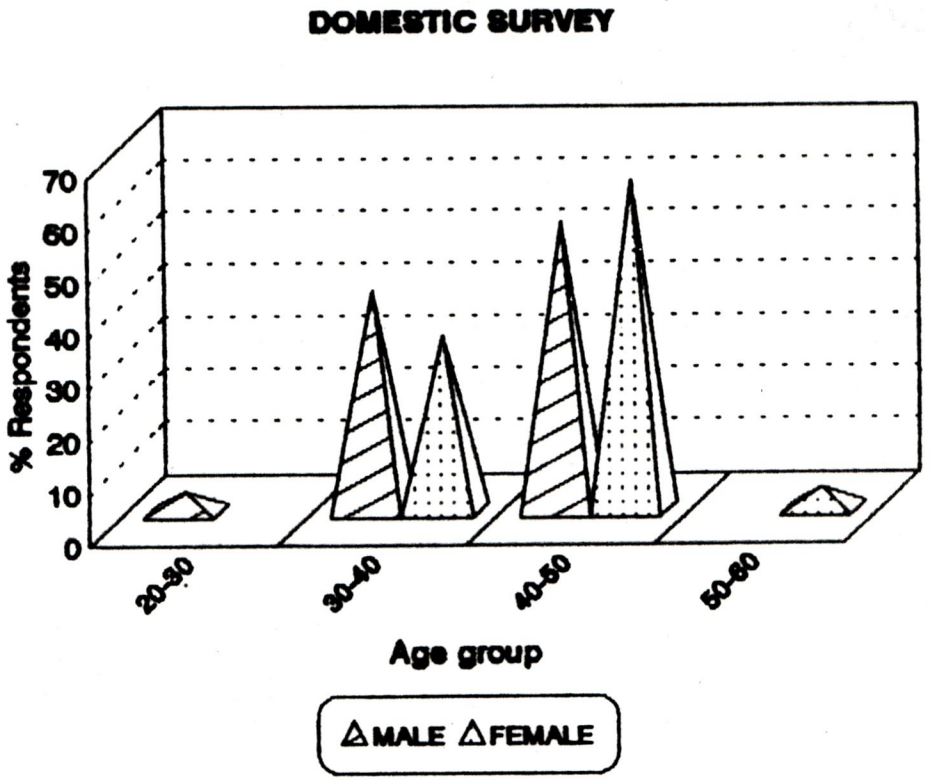
TABLE XII

PATTERN OF AGE OF ONSET OF THE DISEASE

GROUPS	SAMPLES	SEX	AGE IN YEARS							
			20 - 30		30 - 40		40 - 50		50 - 60	
			No.	%	No.	%	No.	%	No.	%
I	D	M	NIL	NIL	14	45.2	2	6.4	NIL	NIL
	N:31	F	2	6.4	12	38.8	1	3.2	NIL	NIL
	H	M	1	2	15	29.4	5	9.7	12	23.5
	N:51	F	1	2	2	4	3	5.9	12	23.5
II	D	M	NIL	NIL	2	5.4	13	35.1	NIL	NIL
	N:37	F	NIL	NIL	12	32.4	10	27.1	NIL	NIL
	H	M	3	4.1	17	23.3	5	6.9	6	8.2
	N:73	F	2	2.7	13	17.8	12	16.4	15	20.6
III	D	M	NIL	NIL	4	28.6	2	14.3	NIL	NIL
	N:14	F	NIL	NIL	1	7.1	7	50	NIL	NIL
	H	M	1	7.1	2	14.2	5	36	1	7.1
	N:14	F	NIL	NIL	NIL	NIL	2	14.2	3	21.4
IV	D	M	NIL	NIL	3	21.4	3	21.4	NIL	NIL
	N:14	F	NIL	NIL	2	14.3	5	35.7	1	7.1
	H	M	5	20	1	4	2	8	3	12
	N:25	F	2	8	1	4	1	4	10	40
V	D	M	NIL	NIL	NIL	NIL	4	66.7	NIL	NIL
	N: 6	F	NIL	NIL	NIL	NIL	1	16.7	1	16.7
	H	M	1	8.3	1	8.3	3	25	3	25
	N:12	M	NIL	NIL	NIL	NIL	1	8.3	3	25
VI	D	M	NIL	NIL	NIL	NIL	1	25	NIL	NIL
	N: 4	F	NIL	NIL	NIL	NIL	3	75	NIL	NIL

It is evident from Table XII that the incidence was highest (38.8%) in the age group of 50-60 years in which 24.6% were females in hospital since Cardiovascular disease incidence increases after menopause (Srilakshmi, 1993).

AGE OF ONSET OF THE DISEASE



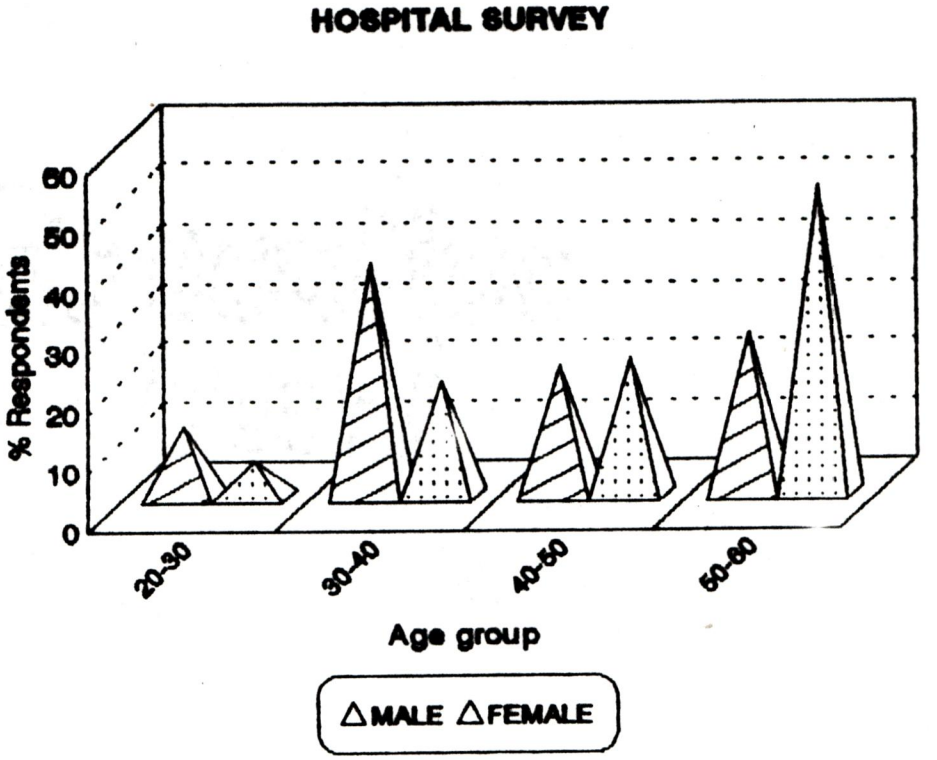


FIGURE - 4

On comparison of hospital and domestic patients it was seen that 36.3% had their age of onset in 30-40 years with 52 patients from hospital (35 male and 17 female) and 50 persons from domestic (23 male and 27 female) survey. This study thus correlates with that of Halloway (1993) who is of the view that middle aged men are at higher risk of developing coronary heart disease than women.

4. SYMPTOMS EXPERIENCED

It was studied that 60% of the patients experienced multiple symptoms like giddiness, chest pain, vomiting, palpitation and sweating in hospital survey while 4% experienced only giddiness, 22.9% chest pain, 5.7% palpitation and 13.1% sweating. Whereas 81.9% of the hypertensives from domestic survey had the only symptom of sweating and 1.4% had chest pain and 2.5% experienced multiple symptoms.

5. TREATMENT UNDERTAKEN BY THE CARDIOVASCULAR PATIENTS.

A healthy life without frequent recourse to toxic drugs is what each one hopes and aims for. Traditional systems of medicine such as Ayurveda, Sidha, Homeopathy and Unani, with their stress on prevention of disease and holistic treatment of the individual without divorcing mind and body are providing attractive to general population.

It is studied from the survey that 3-8% of the patients took ayurveda, sidha, homeopathy and naturopathic treatment while the remaining had allopathic treatment. Anantharaman (1996) justified that in acute conditions like heart attack or skull fracture, allopathy is the only answer as it is done in the present study.

E. DIETARY PATTERN OF THE SELECTED SAMPLES.

Some people eat to live and others live to eat. But to eat to live is better than the other way around. What a person eats is as important as how much he eats and how he eats. The key to healthy life is a balanced diet.

Table XIII gives the details of the oil consumption pattern of the selected subjects so as to bring about a correlation between the oil intake and the incidence of cardiovascular diseases.

1. OIL CONSUMPTION PATTERN.

The following Table XIII reveals the fat and oil consumption pattern among the selected subjects.

TABLE XIII

PER CAPITA CONSUMPTION OF OIL PER DAY AMONG THE SELECTED SUBJECTS

GROUPS	SAMPLES	QUANTITY OF OIL IN ml.				
		10 - 20	20 - 30	30 - 40	40 - 50	>50
I	D N:103	NIL	43	28	22	10
	H N:51	12	33	6	NIL	NIL
II	D N:93	NIL	22	34	25	12
	H N:73	14	41	16	2	NIL
III	D N:32	NIL	10	11	9	2
	H N:14	10	4	NIL	NIL	NIL
IV	D N:123	92	20	11	NIL	NIL
	H N:25	12	11	2	NIL	NIL
V	D N:15	NIL	3	9	3	NIL
	H N:12	7	5	NIL	NIL	NIL
VI	D N:36	NIL	NIL	16	20	NIL

It is clear from Table XIII that 10-20 ml of oil was consumed daily by 31.4% of the patients in hospitals as per doctor's advice. Whereas 74.8% of the 123 domestic samples in Group IV used only 10-20ml of oil per day because of their mode of taking only rice, curd or rasam and egg due to their

economic conditions and lack of time since they were manual workers. Greater than 40ml of oil per day was consumed by Group I (7.9%) and Group II (9.2%) domestic samples of high income group due to inclusion of fried and bakery items in their daily diet.

The analysis of variance between the group is given in Annexure VI. The F ratio between the groups in the oil consumption indicated no significant difference. The oil consumption pattern between the Group III, I, V and II was significant at 5 % level when analysed for Least Significant Difference test. The maximum oil consumption was above 40ml. In domestic survey among the 103 persons who consumed more than 40ml of oil per day 65 (63.1%) were found to be hypertensives. In case of patients in hospitals though the oil consumption has been reduced by them after the onset, 128 (73.1%) out of 175 had cardiovascular disease who consumed more than 40ml of oil per day.

I.a. DURATION OF OIL.

It is clear that 100% in Group III and Group IV used coconut oil and ground nut oil respectively for more than 10 years as they were the producer of the nuts and oil seed. In Group II (44.1% in domestic and 56.2% in hospital) used sunflower oil for a period of 5 years due to the recent awareness of its less cholesterol content.

5-12 Percent switched over to the use of refined oil from coconut or groundnut or gingelly oil. It has also been observed that 4.6% had changed the use of refined oil to sunflower oil.

2. VEGETARIANS AND NON-VEGETARIANS.

Table XIV shows the distribution of vegetarians and non-vegetarians among the selected subjects.

TABLE - XIV

DISTRIBUTION OF VEGETARIANS AND NON - VEGETARIAN AMONG THE SELECTED SUBJECTS

Groups	Domestic survey								Hospital survey							
	Vegetarians				Non - vegetarians				Vegetarians				Non - vegetarians			
	Male		Female		Male		Female		Male		Female		Male		Female	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
I	12	11.6	15	14.5	13	12.6	63	61.1	1	1.9	2	3.8	32	62.7	16	31.6
II	23	24.7	20	21.5	20	21.5	30	32.2	1	1.4	4	5.5	30	41	38	52.1
III	3	9.3	2	6.2	8	25	19	59.3	3	21.4	2	14.3	6	40.8	3	21.5
IV	4	3.2	3	2.4	33	26.8	83	67.4	1	4.0	1	4.0	10	40	13	52
V	2	13.3	2	13.3	4	26.6	7	46.8	---	---	2	16.6	5	41.7	5	41.7
VI	7	19.4	5	13.9	9	25	15	4.7	---	---	---	---	---	---	---	---

It is clear from Table XIV that among the 98 vegetarians in domestic survey, 43 (43.9%) of them belonged to Group II. Of the 304 non-vegetarians, 116 (38.2%) belonged to Group IV and 76 (25%) belonged to Group I.

In the hospital patients it is seen that 9.7% of them were vegetarians and 90.3% were non-vegetarians. Thus it correlates with the study of Thorogood et al (1988) that, total cholesterol and LDL-C was higher in meat eaters than in vegetarians, cholesterol being one of the vital risk factor for coronary heart disease. (Krishna, 1997).

E.1.a. CONSUMPTION PATTERN OF EGG.

It was seen that weekly consumption of egg was high (79.3%) in Group IV selected from rural areas and it was attributed to the fact as conveyed by them that the expenditure spent on cooking egg was less when compared to cooking vegetables.

It was seen that 66.4% of the patients in hospitals did not consume egg after the onset so as to control the serum cholesterol. Flymn & Nolph (1987) corroborated that normolipaemic healthy persons showed significant increase in mean serum cholesterol after eating 3 eggs daily for 10 weeks and a significant decrease within two weeks of crossover to eating no eggs.

E.1.b. CONSUMPTION PATTERN OF FLESHY FOODS.

Among the 304 non-vegetarians, 165 (54.3%) consumed chicken, 96 (31.6%) consumed mutton and 43 (14.1%) consumed fish. Of the fish eaters it was found that 30.2% belong to Group III and Group IV. In hospital survey it was seen that 22.3% and 27.4% consumed mutton and chicken fortnightly and monthly respectively. It was seen that weekly consumption of fish was 16.6% among the patients.

E.2. MODE OF CONSUMPTION OF FOODS.

It was studied from the survey that the samples from urban areas took 3 meals a day while those in rural areas took only two meals a day and mainly rice with combination of dhal or rasam and curd due to lack of time and economic conditions. Cereals were taken in the form of rice, ragi and wheat and the commonly used pulses were redgram dhal, green gram dhal and black gram dhal. Vegetables were consumed daily in urban areas while in rural areas it was used only weekly or occasionally. Raw vegetables in the form of salads were taken by 20% of the patients in hospital. 18.3% of the patients restricted fruits since they felt that it increased the calorie and fat content.

In case of oil rich foods, dosai (28.4%) and poori (47%) consumption was high in domestic samples, while it was

occasional (47.4% dosai and 9.1% poori) in patients in hospital. 78.7% of the patients in hospital did not consume pongal. Snacks in the form of biscuits, sprouted dhals and buns were taken by all the patients. Consumption of papads were restricted by patients (52.6%) and 43.4% of them took butter milk instead of curd.

The following Table XV shows the nutrient intake of the selected subjects since nutritional status is an important indicator of a persons health condition. The percentage ofdistribution of energy from proximate principles is shown in Fig. 6 and Fig. 7.

TABLE - XV

NUTRIENT INTAKE OF THE SELECTED SUBJECTS

Groups	Energy	t	Protein	t	Fat	t	Sodium
DOMESTIC	Mean + SD		Mean + SD		Mean + SD		Mean + SD
Male							
Sedentary	2417+342.3	0.8	61.9 + 90	15.1	70 + 12.4	7.6	547.7 +12.8
Moderate	2595+199.9	4.4	78.2 +15.5	11.1	69.6 +14.2	6.7	533.5 +109.6
Female							
Sedentary	2461+361.3	7.3	75.3+14.1	16.4	66.7+12.7	2.6	539.9+414.1
Moderate	2565+401.7	1.7	70.5+7.1	9.1	64.8+9.8	4.8	568.6+111.1
HOSPITAL							
Male							
Sedentary	1981+442.6	2.2	54.8+11.2	4.6	36.2+8.1	3.5	462+104.9
Moderate	2266+280.4	3.8	57.2+21.1	4.3	34.7+5.8	1.7	383.3+87.4
Heavy	2417+342	5.4	61.9+9.0	12.1	36+12.3	6.6	547.7+121.8
Female							
Sedentary	2211+215.9	3.8	60.3+2.7	5.9	33.4+5.6	0.2	304.1+85.4
Moderate	2109+111.7	1.5	58.3+1.2	155	35.5+0.2	1.3	345.1+49.4
Heavy	2461+361.3	5.7	65.3+14.3	16.3	30+12.7	2.5	349.9+414.1

from Proximate Principles

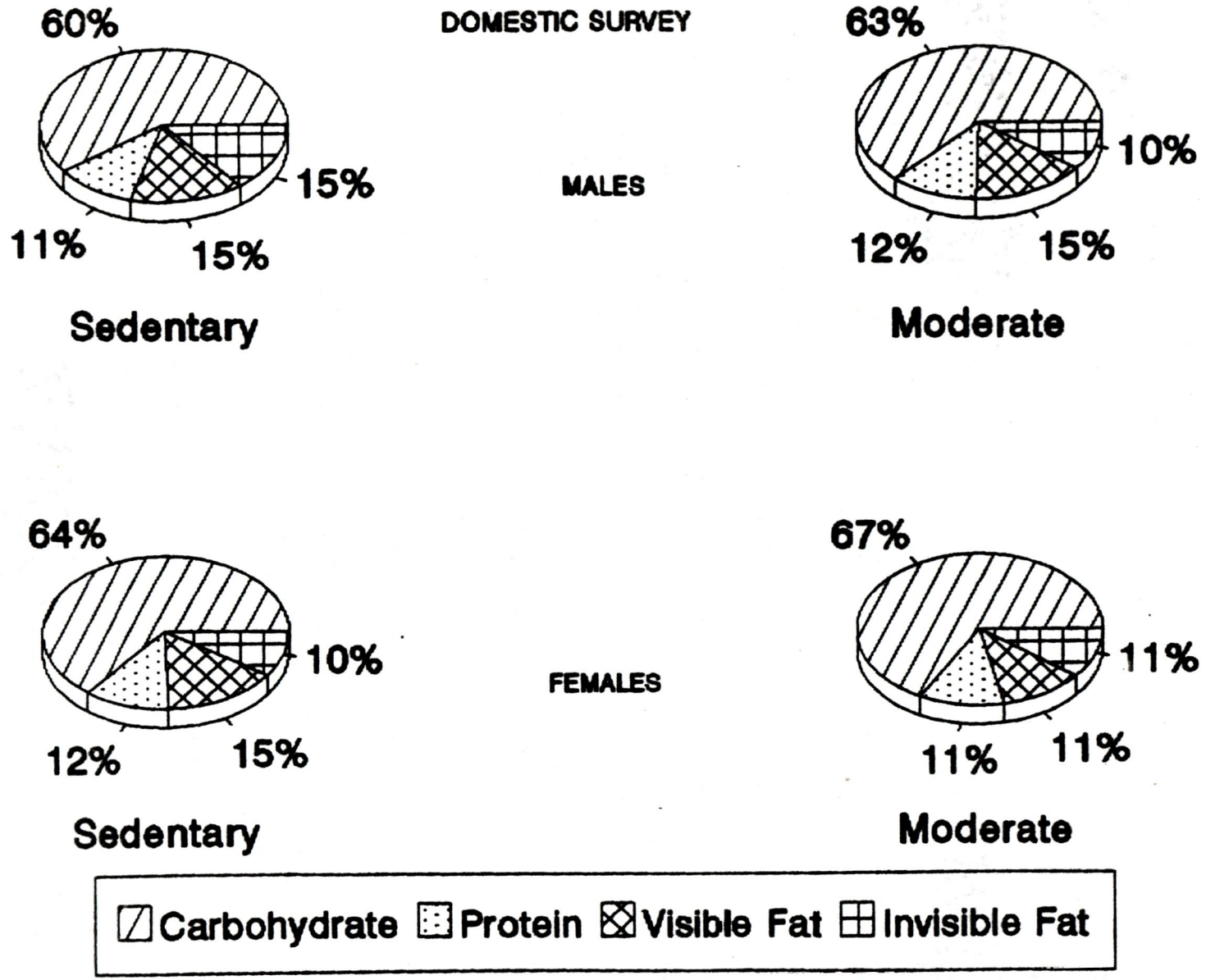


FIGURE - 6

from Proximate Principles

HOSPITAL SURVEY

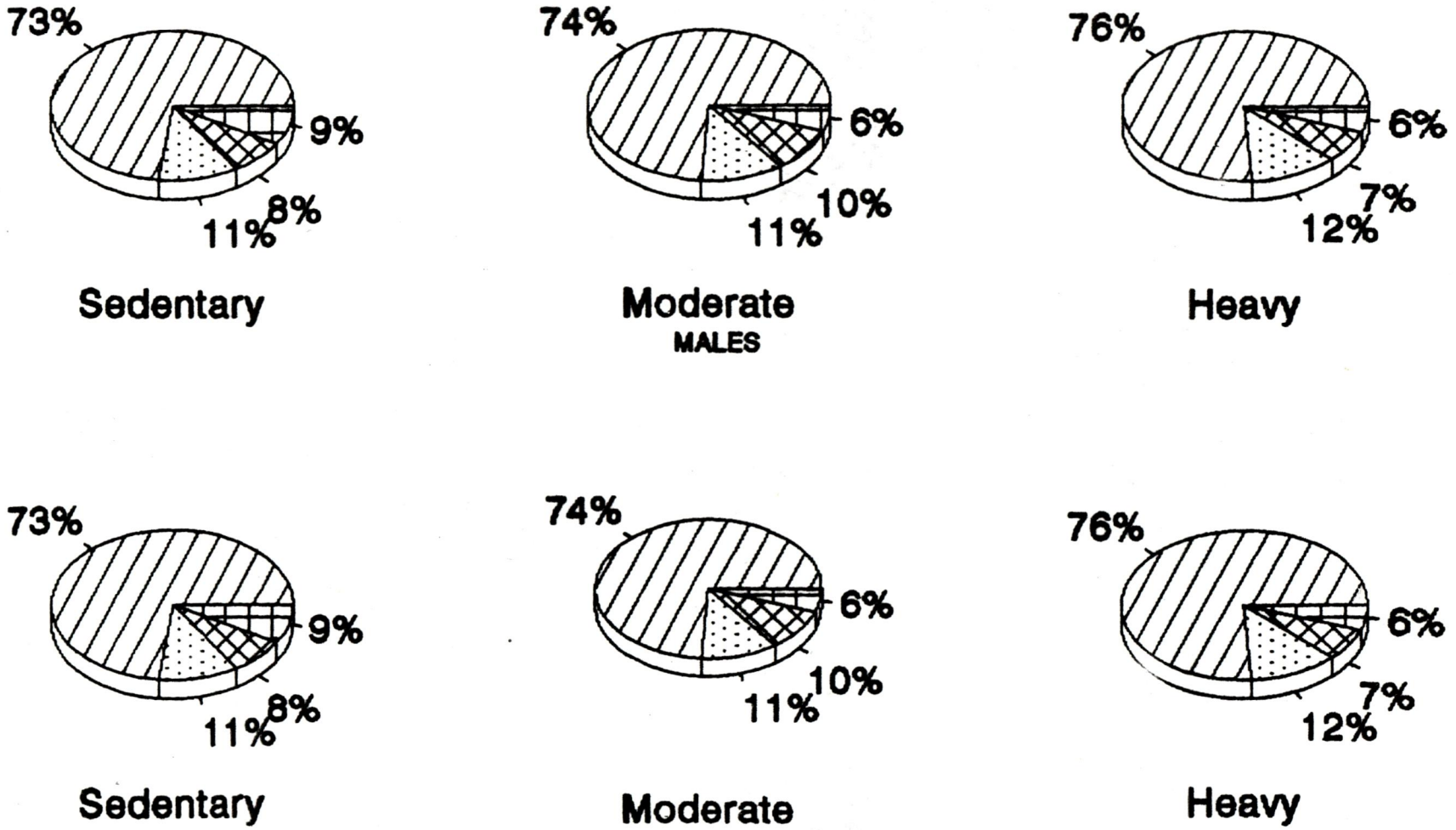


FIGURE - 7

3. SNACKS PREPARED AT HOME.

It was studied that 47% of the subjects prepared sweets and savouries at home from domestic survey. Only 18.9% prepared in hospital survey just to avoid the intake of fatty foods. Only 5.1% of the cardiovascular disease patients used ghee and dalda while 14.7% from the domestic survey used ghee and dalda. All the samples prepared sweets and savouries during festive occasions.

4. TAKING OF FOODS FROM HOTELS.

It was evident from the study that out of 402 samples in domestic survey 182 (45.3%) had the habit of taking food outside and among them 64.3% took fleshy and fried foods. Whereas out of 175 Cardiovascular disease patients only 24 (13.7%) took food outside and among them 79.2% fried foods but consumed steamed foods.

5. INTAKE OF GHEE AND SNACKS BEFORE THE ONSET OF THE DISEASE.

It was noted that 69.7% of the patients in hospital had the habit of taking ghee, in which 19% and 22.9% took ghee and snacks daily and 52.8% of 100 in domestic survey took ghee and 49.1% snacks before the onset of the disease.

6. FOODS RESTRICTED AFTER THE ONSET OF THE DISEASE.

It was seen that 89.1% of the patients in hospital survey restricted sweet, salt, ghee and fried foods while 86.8% restricted salt in hospital survey. Sweet was restricted since it is high in calories, ghee and fried foods were restricted to control cholesterol. Goff et al suggested that reduction in dietary cholesterol have a new favorable effect on serum cholesterol levels of overweight persons

after they have lost weight. Salt was avoided since salt restriction lowers blood pressure in persons with hypertension and also reduces the incidence of hypertension in people at high risk of developing it (Reddy, 1994).

7. AWARENESS OF DIETARY ROLE IN PREVENTION AND CONTROL OF DISEASE.

India's diversity in terms of ethnic groupings and soci-economic clusters offers diets varied according to religions, historical and regional context. Although this culture has established eating habits by nature the intake of food varies, according to the awareness of the role of diet in the prevention of control and disease, in each person.

Awareness of diet was seen in all the patients in both hospital and domestic survey. While only 148 of the other samples (296) knew about the vital role played by the diet in domestic survey.

Table XVI shows the intake of hypocholesterolaemic foods among the subjects.

TABLE XVI

INTAKE OF HYPOCHOLESTEROLAEMIC FOODS.

FOOD	DOMESTIC SURVEY N:402		HOSPITAL SURVEY N:175	
	No.	%	No.	%
Rice bran oil	2	0.5	NIL	NIL
Fenugreek seeds	13	3.2	10	5.7
Fish	23	5.7	33	18.9
Garlic	57	14.2	38	21.7
Ginger	51	12.7	14	8
Fibre rich vegetables	83	20.6	55	31.4
Less fat foods	25	6.2	25	14.2
No.	148	36.8	NIL	NIL

It is seen that from Table XIX 47.5% of the household samples and 61.1% of the patients in the hospital included hypocholesterolaemic foods like ginger, garlic and fibre rich vegetables in their daily diet.

f. SERUM LIPID PROFILE IN RELATION TO FAT INTAKE.

Over the past 25 years as public awareness of the risk factors for heart disease has grown, blood cholesterol levels have decreased by about 7.1 and overall deaths from heart disease are down by one fourth. However the total number of people with heart disease has not changed (The Hindu, 1995).

It is pursued from the study that of the seven persons who were at higher risk level of serum cholesterol five were non-vegetarians and two of three persons at high risk level of LDL-C were non-vegetarians in males. In females all the three, two of high risk serum cholesterol and one LDL-C were non-vegetarians among the sub samples in domestic survey. Thus this study correlates with Melby et al (1994), who conducted a study to compare the serum lipid among 3 dietary groups of African American adults vegetarians, semi-vegetarians (1-3 servings of animal flesh per week) and non-vegetarians (daily consumption of animal flesh). Vegetarians had significantly lower concentrations of serum total cholesterol, LDL-C, HDL-C and LDL-C/HDL-C than the non-vegetarians. The semi-vegetarians had lipid values intermediate to the vegetarians and non-vegetarians.

In patients in hospitals all of them had high levels of lipid profile and they were under strict dietary treatment as per the doctor's and dietitian's advice. Individual values of serum lipid profile of the subsamples is shown in Annexure V.

2. CORRELATION BETWEEN OIL CONSUMPTION AND LIPID - PROFILE.

The following Table XVII depicts the correlation between oil consumption and lipid profile among the sub samples in domestic survey.

TABLE XVII

CORRELATION BETWEEN OIL CONSUMPTION AND LIPID PROFILE

GROUPS	SEX	MEAN PER CAPITA CONSUMPTION OF OIL	S.C	TG	HDL.C	LDL.C	VLDL.C
I R	M	39.3	0.863	0.119	0.392	0.622	0.130
	F	39.1	0.802	0.325	0.261	0.672	0.235
II S	M	35.7	0.125	0.008	0.352	0.254	0.008
	F	33.6	0.943	0.207	0.686	0.073	0.197
III C	M	36.7	0.879	0.915	0.365	0.562	0.895
	F	40.9	0.183	0.901	0.635	0.308	0.022
IV G	M	37.1	0.117	0.177	0.46	0.111	0.181
	F	35.4	0.160	0.520	0.943	0.178	0.503
V Gin	M	40.9	0.596	0.727	0.717	0.621	0.285
	F	39.5	0.916	0.591	0.804	0.233	0.602
VI	M	39.5	0.371	0.541	0.503	0.290	0.602
	F	37.1	0.831	0.620	0.769	0.677	0.560

N:4 In all groups
SC - Serum Cholesterol

It is clear from Table XXI that though the per capita consumption of refined oil was higher (40g) the serum cholesterol level has not increased due to its high PUFA content. Since in Group II the sunflower oil consumption was less, the lipid-fractions was normal. No significant difference was seen between consumption of groundnut oil and serum cholesterol. In gingelly oil it was seen that with the intake of 40g of oil there was a higher level of lipid fractions. In coconut oil it was seen that there was a normal level of all serum lipid fractions except for LDL-C in female subjects.

It is thus evident from the Table XXI that the lipid-fractions will be normal if the oil consumption meets the daily requirement not exceeding 20 +_ 10g. (ICMR, RDA, 1986).

3. ASSOCIATION OF BODY MASS INDEX WITH SERUM LIPID PROFILE.

A fine correlation was seen between obesity and serum lipid profile. Among the 22 obese persons selected, 19 (86.4%) had serum cholesterol levels above the normal value. In the patients in hospitals are the 10 obese persons had high risk serum cholesterol levels.

Thus this study correlates with that of Slabber et al (1994) who is of the view that hyperlipidaemia is a common finding in obesity.

Summary and Conclusion

V. SUMMARY AND CONCLUSION

Diet heart hypothesis proposed that an elevated intake of total fat, saturated fat and dietary cholesterol increase serum cholesterol which in turn increase the risk of developing cardiovascular disease. Thus fat plays as an important risk factor along with smoking, alcohol, familial tendency, physical inactivity and obesity in determining the incidence of cardiovascular disease. Keeping this in view the present study was conducted to find the incidence of cardiovascular risk factors among the adult population based on fat and oil consumption pattern.

This study was conducted in both urban (247) and rural (155) areas of Coimbatore after stratifying the areas based on the oil consumption. The various groups of oils: Refined oil (Group I), Sunflower oil (Group II), Coconut oil (Group III), Groundnut oil (Group IV), Gingelly oil (Group V)and mixture of oils (Group VI) were commonly used by the people. A total sample of 402 (139 male and 263 female), 103 in Group I, 93 in Group II, 32 in Group III, 123 in Group IV, 15 in Group V and 36 in Group VI were selected in domestic survey. A total sample of 175 (89 male and 86 female), 51 in Group I, 73 in Group II, 14 in Group III, 25 in Group IV and 12 in Group V were selected in hospital survey. There were no patients who used mixture of oils.

The results and discussion of the study is summarised below:

Among the samples selected in domestic survey majority (91.6%) of those in rural areas were not educated as that of urban areas (96% literacy). Low income group spent 60% of their income on food (54.2%) in rural areas while in urban areas 47.7% spent 30-40% on food. As far as activity was concerned in rural areas most of them were moderate and heavy activity persons (65.8%)while in urban areas most of them were sedentary (68.4% in domestic and 77.7% in hospital). The family history of the cardiovascular disease was found in 78.3% and 38.3% of the patients in hospital and domestic survey respectively.

Overweight (33.7%) and obesity (10.3%) was seen in hospital survey. In domestic survey, it was observed that 25.6% were over weight and 4.4% were obese. Exercise was performed by 64.4% of the patients in hospitals while only 34.3% in domestic samples performed exercise. The habit of chewing tobacco (29.7%) was seen only in rural areas.

Among the 59.5% of the patients in hospitals who had the habit of smoking, 23.6% withdrew from the habit of smoking after incidence and 35.9% reduced the number and frequency of smoking after the incidence. The alcohol was consumed by 39.6% of the domestic subjects and 20.2% of the patients in hospitals.

Hypertension was more prevalent (22.9%-9.7%male and 13.2%female)in domestic survey while in hospital survey along with hypertension,myocardial infarction and ischaemic heart disease were seen in 38.2% (19.4% male and 18.8% female) age group of 30-40 years (29.7%) in hospital and 49.1% in domestic subjects. Onset of the disease at the age of 50-60 years was common among females (24.6%) while in this age group it was seen only in 14.2% males.

Various risk factors had been responsible for the onset of the disease and they are,

- Heredity the most important risk factor and was seen in 59.4% of the subjects.
- Smoking another important risk factor was seen in 49.6% of the patients.
- Physical inactivity was seen in 43.4% (15.7% male and 27.7% female) of the patients.
- Alcohol consumption was seen in 40.9% of the patients.
- Faulty dietary habits was seen in 37% of the patients.
- Overweight and obesity was seen in 37.7% domestic subjects and 44.4% patients in hospitals before the onset of the disease.
- More than 5 cups of coffee was consumed by 17.3% of the patients before the onset of the disease.
- The female (2.6%)who had the habit of chewing tobacco were suffering from myocardial infarction.

Regarding the dietary pattern 90.3% of the patients in hospitals were non-vegetarians. Most of the patients in hospitals (31.4%) used only 10-20ml of oil per day while 27.9%of those in urban areas of domestic survey took greater than 40ml of oil per day. Persons in Group III and Group IV used coconut and groundnut oil respectively for more than 10 years since they were the producer of it. While sunflower oil was used for less than 5 years (14.1% in domestic and 56.2% hospital) due to the present awareness of its high PUFA content. The advice of the doctors made to change the use of oil after the onset of the disease from either groundnut or coconut or gingelly oil to refined and sunflower oil by 5-12%

Consumption of egg (66.4%), Mutton (22.8%) and chicken (20.3%) was occasional after the onset of disease. Fat and oil rich food consumption like dosai(47.4%), Poori (9.1%), Pongal (78.7%), Papad (52.6%) and Curd (43.4%) was occasional in patients in hospitals while it was high among domestic subjects. Even preparation of sweet sand savouries at home (81.1%) and intake of fried and fleshy foods in hotels (79.2%) was avoided among the patients. The patients in hospital (61.1%)and domestic survey (47.3%) used fibre rich vegetables in their diet.

The F ratio between the groups in oil consumption indicated no significant difference, whereas in least significant difference test there was significance at 5%level

between Group I, III, V and II. The maximum oil consumption was above 40ml. Among the 106 persons in domestic survey and 175in hospital survey, 65(63.1%) were found to be hypertensives and 128 (73.1%) had cardiovascular disease respectively who consumed more than 40ml of oil per day.

On comparison between serum lipid profile and oil consumption it was seen though refined oil was taken in more amount (40g) the lipid fractions did not increase due to its high PUFA content. In coconut oil it was seen that there was a normal value of all serum lipid fractions except for LDL-C in female subjects. No significance difference was seen between consumption of groundnut oil and sunflower oil. With a higher intake of gingelly oil there was an increase in lipid fractions.

Thus it is concluded that higher intake of fats and oil also play an important role in determining the incidence of cardiovascular disease along with other risk factors.

Suggestion for future study.

Extensive studies can be conducted to prove the effect of different types of oil in the incidence of cardiovascular disease.

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Appendices

ANNEXURE - I

QUESTIONNAIRE TO FIND THE INCIDENCE OF CARDIOVASCULAR DISEASES BASED ON OIL CONSUMPTION

1. Name :
2. Address :
3. BACKGROUND INFORMATION

Name of the Members in the family	Age	Sex	Education	Occupation	Income

4. Weight : Kg.
5. Height : CM.
6. Body mass index :
7. Waist measurement :
8. Hip measurement :
9. Waist to Hip ratio :
10. Any familial tendency of CVD : YES NO
11. If yes, mention the person affected by this
    Grand parents Parents Siblings
12. Mention the disease they were affected by

LIFE STYLE PATTERN

13. Do you have the habit of execisting regularly : YES NO.
    If yes, mention the exercise :
    Walking Jogging Yoga Others if any
14. Do you have the habit of chewing tobacco : YES NO.
15. Do you have the habit of smoking : YES NO.
16. Are you an alcoholic? YES NO
17. Are you a vegetarian or non- Vegetarian
18. Are you suffering from any of the heart disease : YES NO.
19. If yes, mention the disease:
20. Mention the age of onset of this disease.
21. Mention the symptoms experienced by you initially.
22. Mention the treatment undertaken by you.
23. Are you under strict dietary treatment : YES NO.
24. If yes, mention the diet consumed before and after the onset of the disease.

Diet before the onset of the disease :	Diet after the onset of the disease
Early morning :	
Breakfast :	
Mid morning :	
Lunch :	
Mid-afternoon :	
Tea :	
Dinner :	
Frequency of fleshy foods consumed.	

25. Mention the foods used in large quantity before the onset of the disease.

26. Mention the oil and other fats used for cooking before the onset of the disease.

Name of the item	Frequency Daily	Weekly	Fortnightly	Monthly	Quantity
Oil					
Ghee					
Others					

27. Mention the snack items consumed by you before the onset the disease

Name of the item	Oil used	Frequency and quantity Daily	Weekly	Fortnightly	Monthly

28. Mention the

Foods avoided

Foods used in large quantity.

29. If you are not suffering from any of the heart disease, mention your usual dietary pattern.

Early morning :
Breakfast :
Mid-morning :
Lunch :
Mid afternoon :
Tea :
Dinner :
Frequency of fleshy foods consumed.

30. Mention the oil used for cooking.

Refined oil :
Groundnut oil :
Sunflower oil :
Gingelly oil :
Coconut oil :
Others if any :

31. Mention the snack items prepared at home .

Name of the item	Daily	Weekly	Frequency Fortnightly	Monthly	oil used	Quantity
Sweets						
Savouries						
Bakery items						
Pickles						
Appad						

32. Mention the method of preparation for the following items

Name of the item	Frequency	Method of Preparations	Quantity of oil used
Dosai			
Poori			
Pongal			
Chappathi			
Others			

33. Mention the duration of oil used.
34. Are you aware of the role of diet in various disease.
35. Mention the hypocholesterolaemic foods consumed by you
36. Give the expenditure pattern of foods.

Name of the item	Frequency with quantity purchased			
	Daily	Weekly	Forthnightly	Monthly
Cereals				
Pulses				
Vegetables				
Fruits				
Fleshy foods				
Milk and its products				
Nuts				
Oil				
Others				

37. Do you have the habit of takin foods in hotels. YES NO.

If Yes, answar the following column

The time Visited.	Frequently				Favaourable items	Quantity
	Daily	Weekly	Fortnight	Monthly		

ANNEXURE II

ESTIMATION OF CHOLESTEROL

PRINCIPLES OF THE REACTION

The Managent Cholesterol 500 is a fully enzymatic procedure with colorimetric determination at 500nm.

The reaction takes place in three stages

Esterified cholesterol ---(Cholesterol-esterase)---> Cholesterol+fatty acids

Cholesterol+O ---(Cholesterol Onidare)---> 4-Cholesterol+ H O

The optical density read at 500 nm is proportional to the concentration of total cholesterol.

REAGENTS

S. No	Composition	Final Concentration of Reconstituted Reagent
1.	ENZYMES	
	Sodium cholate	1.2 mmol/1
	4. Ammo antipyrine	0.12 mmol/1
	Peroxidase	500 U/I
	Cholesterol oxidase	35 U/I
	Cholesterol oxidase	200 U/I
2.	BUFFER	
	Phosphate buffer	100 mmol/1
	Phenol	2b mmol/I

Storage

Store the package at 2 - 8 C

Specimen's

Use unhaemolysed serum

Reagent preparation

Reconstitute a vial Enzymes (Reagent I) with one bottle of Buffer (Reagent 2) Mix gently until completely dissolved. Do not shake. Shaking might cause enzymes danaturation. The reconstituted reagent is stable one month at 2-8 C.

	Sample	**Procedure Standard**	**R.Blank**
Reagent	3 ml	3 ml	3 ml
Serum	0.03 ml	-	-
Standard	-	0.03 ml	-
Distilled water	-	-	0.03 ml

Incubate 10 minutes at 37 C. Read the opticaly density of the specimen and the standard against the reagent blank.

Note

1. Colour development is stable for 30 minutes at room temperature.

2. Volumes may be modified proportionally.

The test is linear upto 500 mg/dl

For higher concentration repeat the test on a specimen diluted in saline solution and multiply. The rest by the dilution factor:

Formula

Values are calculated with the following formula

$$\text{Cholesterol mg/dl} = \frac{\text{O D Specimen}}{\text{O D Standard}} \times \text{Concentration standard mg/dl}$$

The standard is available separately.

Expected values

150 - 250 mg/dl

ANNEXURE - III

ESTIMATION OF TRIGLYCERIDES

Contents

Reagent 1 (5 bottles) : Buffer

Store at 2 to 8 C : Active ingredients piper buffer ESDAS

Reagent 2 (5 bottles) : Enzymes

Stored at 2 to 8 C : Active ingredients Lipoprotein lipore
Clycerokinase
Glycerol -3- Phosphate oxidase
Peroxidase
4 - Amino antipyrine ATP

Reagent 3 (1 bottle) : Standard
Store 2 to 8 C : (Triglycerides 200 mg/dl. Ready to use)

Preparation of Working Solution

Transfer and dissolve contents of one bottle of Reagent - 2 With one bottle of Reagent I. Mix well and store at 2 to 8 C.

The enzymes chromogent reagent.

Procedure

Reaction temperature : 37

Pipette into test tubes

	Blank	Standard	Test
Enzyme chromogen	2.0 ml	2.0 ml	2.0 ml
Reagent		0.2 ml	2.0 ml
Standard	-	-	-
Sample	-	-	-

Note : For laboratories using instruments of cuvette capacity more than 1.0 ml sample, standard and enzyme chromogen reagent volumes may be proportionally increased.

Mix and incubate at 37 C for 5 minutes. Read absorbance of the test (AT) Standard (AS) and the reagent blank (AB) against distilled water at 546 nm wavelength (530 to 570) or with green fitter.

The colour developed is stable for 1 hour at room temperature if protected from direct light.

Calculations

Triglycerides concentration (mg/dl)

$$\frac{A}{A} \times \frac{A}{A} = 200$$

To convert mg/dl to mmol/l,

use equation mmol/l= mg/dl x 0.0114

Normal Values

Serum Triglycerides

Men	=	60-165 mg/dl
	=	0.68-1.88 mmol/i
Women	=	40-140 mg/dl
	=	0.46-1.60mmol/l

Linearity

This method is linear upto 1000 mg/dl. For sample values highere than 1000 mg/dl dilute the sample suitably with 0.9percent saline and repeat the assay.

Apply proper dilution factor to calculate the final result

Automated Application

Application sheets for use on specific semi-automatic batch and auto analyzers were available on request

Summary

Enzokit Triglycerides uses the CPO-PAP method for estimationg Serum triglycerides. Use of lipase enzyme to liberate glycerol from triglycerides and sequential enzyme system for estimating glycerol makes the method specific. The method is sensitive due to the high molar extinction co - efficient of the final colour complex and consequently to the sample volume is decreased. The final colour complex is within the visual range.

Principle

Serum triglycerides are hydrolyzed to glycerol and free fatty acids by lipase. In the presence of ATP and glycerokinase, the glycerol is converted to glycerol - 3 - phosphate. The glycerol 3 phosphate is then oxidised by glyerol - 3 phosphate oxidase to yield hydrogen peroxide. Hydroxide reacts in the presence of peroxidase with ESPAS (N-ethyl - N - SulfopropyI - n - anisidine) and 4 amino antipyrine to form a coloured complex. The intensity of the colour so developed is proportional to triglycerides concentration and is measured photometrically at 546 nm (530 nm) or with green fitter.

Triglycerides + H O $\xrightarrow{\text{Lipoprotein lipase}}$ Glycerol + Fatty acids

Glycerol + ATP $\xrightarrow{\text{Glycerokinase}}$ Glycerol -3- phosphate + ADP

Glycerol - 3 - Phosphate oxidase + H O

+ Dihydroxy acetone phosphate

H + 4- amino antipyrine + ESPAS Peroxidase

Qunioneimini + H O

Clinical Significance

Serum triglycerides estimation is of significant importance in the investigation of hyper lipoproteinaemia. The levels may to found evaluated in altherosclerosis, diabetes mellitus, glycogen storage diseases like VonGierkes disease, alcoholism, secondary hyperlipoproteinaemia and nephrotic syndrome. It forms part of parents lipid profile.

ANNEXURE - IV

ESTIMATION OF CHOLESTEROL HDL

Menagent cholesterol HDL allows determination of the lipoprotein HDL after precipitation of LDL and VLDL fractions with phosphotungstic acid and magnesium chloride.

Reagents

		Composition
Reagent	3 x 10 ml	Phosphotungstic acid 13.9 mmol Magnesium chloride 490 mmol/1
Standard 1	1 x 5 ml	20 mg/dl
Standard 2	1 x 5 ml	20 mg/dl
Standard 3	1 x 5 ml	40 mg/dl

Storage

Store the package at 25 C

Specimens

Serum

Reagent Preparation

The precipitating reagent (Reagent 1) is ready for use.

Procedure

In a centrifuge test tube

Serum 1 ml

Precipitating reagent 0.1 ml

Mix and let stand 10 minutes at 18 - 25 C

Centrifuge 15 at 5000-6000 spm. Remove the supernatant and measure the HDL cholesterol using Menagent cholesterol 500.

Formula

Calculate the results using the Menagent cholesterol 500 produce; multiply the value obtained by 1.1 to allow for dilution occuring with precipitation.

Expected Values

Men	=	30-60 mg/dl
Women	=	40-70 mg/dl

Storage and stability

Enzokit triglyceride reagents are stable till the expiry date indicated on the labels when stored at 2 to 8 C. The enzymes chromogen reagent is stable for two weeks at 2 to 8 C. When stored in amber coloured vial specimen collection and storage.

1. Serum from a fasting blood sample is preferred
2. Plasma collected with use of heparin as anticoagulant may also be used.
3. Plasma collected with use of anticoagulant contaning flouride of oxalate should be avoided.

Samples should be used on the same day. If necessary they may be preserved in a refrigerator at 2 to 8 C for four days. Samples should be brought to room temperature before use.

Precautions

Enzokit Triglycerides if for invitro use only. Avoid contact with skin, eyes and clothes. Do not pipette by mouth.

Interfering Substances

Haemolysis and high bilurubin content can interfere with the test.

ANNEXURE V

CORRELATION BETWEEN FAT CONSUMPTION AND BMI AND WHR AND SERUM LIPID PROFILE

DOMESTIC SURVEY

MALES

PER CAPITA CONSUMPTION OF OIL IN ml	BMI	WHR	SERUM LIPID PROFILE SC	TG	HDL-C	LDL-C	VLDL-C
VEGETARIANS							
38.1	30	1.2	230	227	48	136	45
40.2	31.5	1.1	245	155	35	180	31
26.4	28.5	0.91	185	85	48	120	17
31.0	29.4	1.1	150	132	35	88	26
35.2	30	1.1	170	70	60	96	14
31.2	29.9	0.93	200	114	50	127	23
31.3	28.5	0.94	188	90	48	122	18
36.4	29.1	0.95	190	96	38	132	19
38.2	27.6	0.97	205	135	50	128	27
41.2	28	0.8	170	140	50	92	28
42.3	31	1.0	168	117	37	107	23
31.4	29.4	0.98	167	124	42	100	25
NON-VEG							
38.9	30.3	1.3	262	230	52	164	46
40.0	29	0.99	218	190	48	132	38
39.8	31.4	1.4	240	230	46	148	46
45.6	34	1.2	262	260	60	150	52
41.5	34.1	1.1	200	100	41	139	20
38.8	28.8	0.94	190	105	40	130	21
41.3	32.3	1.0	235	125	56	148	25
39.4	29.6	0.96	215	100	58	157	20
43.2	31.7	1.1	247	138	48	170	28
41.1	30.8	1.2	248	130	43	180	27
44.4	33.2	1.1	243	156	67	145	31
40.1	29.7	1.1	210	125	54	131	25

FEMALES

VEGETARIANS							
41.2	30.4	0.86	214	138	50	139	28
35.4	29.2	0.83	196	223	37	115	45
30.4	28.5	0.82	183	167	39	148	33

38.2	29.4	0.89	197	233	42	128	47
31.1	29.6	0.88	200	85	45	138	17
38.2	28.9	0.84	200	160	45	149	32
31.4	28.8	0.85	174	170	45	35	34
41.4	31.3	1.1	232	92	50	164	18
42.3	30.3	1.1	235	156	62	142	31
38.9	32.4	1.2	215	200	43	155	40
36.4	29.4	0.83	205	60	47	146	12
31.1	26.4	0.72	198	77	40	142	15

NON-VEG

38.7	34	1.3	300	110	60	178	25
41.2	31.1	0.88	235	156	65	138	31
34.1	25.9	0.68	215	156	45	140	31
31.1	29.7	0.88	216	97	60	140	19
43.2	31.4	0.89	224	183	48	140	36
41.1	28.6	0.87	210	108	53	135	22
32.4	27.9	0.79	190	80	55	120	16
36.4	28.5	0.86	178	70	40	124	14
38.1	31.0	1.0	225	92	54	153	18
38.1	30.5	1.1	260	108	67	172	22
40.4	31.1	1.2	223	74	48	160	15
40.4	29.6	0.85	155	105	38	78	21

HOSPITAL SURVEY

MALES

VEGETARIANS

16.8	30.1	1.1	275	150	64	156	30
17.5	30.4	1.3	288	145	64	162	29
22.6	30.0	1.1	274	182	62	176	36
25.8	29.4	1.1	262	261	60	150	52
28.8	26.4	0.86	260	203	50	170	41

NON-VEG

29.1	25.2	0.89	218	130	58	139	26
15.5	23.4	0.82	240	230	48	146	46
17.8	30.8	1.0	396	130	56	316	26
17.8	31.1	1.0	310	187	64	210	37
21.1	32.5	1.1	267	220	60	163	44

FEMALES

VEGETARIANS

16.6	30.1	1.1	225	107	45	98	21
17.4	29.4	0.85	225	92	54	153	18
17.4	29.9	0.83	235	158	45	138	32
18.9	28.4	0.86	232	92	40	154	18
18.9	23.2	0.74	200	114	50	127	23

NON-VEG

17.8	26.4	0.78	238	128	48	139	26
16.9	30.1	1.2	280	142	55	181	28
21.2	30.9	1.1	248	130	60	159	26
21.1	30.0	0.86	274	124	58	154	25
16.6	29.7	0.84	200	103	48	134	21

SERUM LIPID PROFILE	NORMAL	BORDERLINE RISK	HIGH RISK
Serum cholesterol	<200	200-239	≥240
Triglyceride	<250	-	>250
HDL-C	30-80	-	<30
LDL-C	<130	130-159	≥160

Source : NCEP

ANNEXURE VI

1. Analysis of Variance between groups

F ratio = 1.9808

Not Significant

2. Least Significant Difference Test

Group	2	4	6	3	1	5
2						
4						
6						
3	*					
1	*					
5	*					

(*) Denotes pairs of groups significantly different at the 0.050 level.