# STANDARDISATION OF REVERSAL DIETS FOR CARDIAC PATIENTS

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By

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***THESIS***

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I hereby declare that this thesis entitled **"Standardisation of reversal diets for cardiac patients"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associate ship, fellowship or other similar title, of any other University or Society.

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# INTRODUCTION

# INTRODUCTION

"மிகினும் குறயினும் நோய் செய்யும்
நுலோர் வளிமுதலா எண்ணிய மூன்று"

An increase or decrease in the amount of food (divergence from the balanced diet) results in one or more of the diseases -says the great poet Thiruvalluvar in his renowned work "Thirukkural".

Proper diet is the key to good health and vigor. Diet and nutrition are synonymous with health. The preventive role of corrective nutrition is an ever evolving process. Inadequate and improper diets are not only responsible for undernutrition, but also contribute to several chronic diseases like cardiovascular diseases, diabetes and cancer.

Cardiac diseases have no geographical and racial boundaries. They occur throughout the world. It can no longer be considered a problem of only affluent countries. With rapid industrialization, socio-economic development and increase in life expectancy, the stage is now set for chronic diseases in India.

Significant cardiovascular disease began to emerge sometime ago in India. Soon it became really rampant as people could afford diets rich in animal products and when the food industry began producing highly processed foods crammed with calories and emptied of nutrition.

Chronic diseases are multifactorial in origin and therefore require a complex mix of interventions. Factors interlinked with heart health include nutritional, such as calories, fats, sugar, alcohol, vitamins and trace elements; psycho-social and behavioral factors like hostility, negative emotions such as anger, greed, undue desires and maladjustment to daily life style pose threats to a healthy heart. Thus control over environmental factors including the food we eat, the water we drink, the air we breathe and the surroundings we live in, will all go a long way in presenting a healthy heart.

Primary prevention of heart disease is ideal, but may not always be possible. Our preventive strategies must therefore extend beyond primary prevention. The techniques, tools and therapeutic breakthrough seen in the last 25 years will form the bridge to the next millennium to continue our crusade for primary, secondary and tertiary prevention and decrease deaths and disability from heart disease in the 21st century.

Reducing intake of saturated fat and cholesterol and avoiding excess calories, which can lead to obesity, remain the corner stone of the dietary approach to decreasing risk of atherosclerotic vascular disease. During the past 20 years, however, there has been renewed interest in other dietary components and diet exchange that might favourably improve lipid profiles and reduce the risk of coronary heart disease.

Reversal diet is the modification of normal diet to slow down the progress of heart diseases. Standardisation of reversal diet and preparation of ready-reckoner are of great significance to cardiac patients, dietitians, doctors and to the public. Reversal diet, prescribed by Dr. Dean Ornish is observed to have less than 10 % of calories from fat, excluding foods, rich in saturated fat and all stimulants, and allowing moderate use of salt and sugar. The diet is also found to be high in fibre.

Reversal diet has been devised and is being practiced in the United States for combating heart diseases. Till recently, no such approach was undertaken in Kerala. So the present study is an attempt to standardise and modify the normal diets of Kerala according to the principles of reversal diet and to assess its impact on the health status of cardiac patients.

# REVIEW OF LITERATURE

# 2. REVIEW OF LITERATURE

The literature collected for the study on **"Standardisation of reversal diets for cardiac patients"** is listed under the following heads:

2.1. Prevalence of heart diseases.

2.2. Risk factors in the occurrence of heart disease

2.3. Influence of diet on heart diseases

2.4. Standardisation of recipes

2.5. Reversal diet

2.6. Diet counselling

## 2.1 Prevalence of heart diseases

The prevalence of cardiac diseases is a wide spread problem in today's world. Epidemiologists first reported in the 1950's that the incidence of heart disease in Europe increased four fold the farther north you travelled, with the highest rates being reported in Finland, and the lowest in southern Italy.

All over the world, cardiovascular diseases (CVD) are now recognized as one of the main cause of death in adults (Medical Update, 1999). In most western countries, cardiovascular disease is responsible for about 50 per cent of deaths. (WHO, 1986)

Sharper et al. (1986) reported that UK had one of the highest death rates for IHD especially in Scotland and Northern Ireland. Stephan and Sieber (1994) has reported that the mortality rate from CHD has declined in United Kingdom since 1979, whereas in USA, mortality from this disease began to fall in 1968 and has continued since that time.

In Srilanka, where coconut oil is the predominant dietary fat, the death rate due to IHD is only one per 1,00,000 as against 16-17 per 1,00,000 in other countries with little coconut oil consumption (Ramadas and Easwaran, 2000a).

Ball (1988) revealed that CHD and cerebro-vascular diseases were the major causes of death in the western world. Watts et al. (1988) reported that atherosclerotic CHD was the main cause of death in most of the industrial communities.

About 67 million Americans were reported to have some potentially dangerous form of heart or blood vessel disease (AHA, 1999).

WHO (1996) has predicted that deaths due to cardiovascular diseases would double by 2015. According to AHA (1999), African Americans have more severe hypertension and risk of heart disease than whites.

The clinical picture of Indians is not different when compared with that of Europeans. Achaya (1995) pointed out that the deaths from CVD in India were almost equal to that in all the developed countries put together.

Bhatia (1985) and Ozario (1988) reported that the prevalence of CHD in our country in the general population, above the age of 40 were 2.5 percent.

Castelli (1986) stated that 10% of Indians died each year because of heart diseases and 12 million Indians were at risk for developing atherosclerosis.

A screening conducted by Jajoo et al. (1988) to detect the prevalence of CHD among 2433 subjects in India aged 30 and beyond, revealed that the prevalence of CHD was 14.80 per thousand.

Reddy (1993) had remarked that the upwardly mobile Indian at this rate may be walking into a coronary trap as he moves away from the traditional gastronomical wisdom to a world of high fat, high animal protein and high junk diet.

According to a study conducted by Chadha et al. (1997), a five fold higher prevalence of CHD had been revealed in the urban survey sample as compared to rural population.

The higher risk of CVD in Indians is explained partly by the Indian tendency to accumulate fat around the mid-riff, increased prevalence of diabetes, less amounts of High Density Lipoprotein (HDL) and higher levels of plasminogen-activator-inhibitor-1.

## 2.2 Risk factors in the occurrence of heart diseases

A risk factor is something that is associated with an increased risk of developing a disease with passage of time.

CVD is a disease of lifestyle and risk factors include cigarette smoking, obesity, elevated serum cholesterol, low levels of physical activity, chronic stress and hostility (Taylor et al., 1998). The AHA (1999) has identified several risk factors for CHD, which causes heart attack. These include age, gender and heredity, along with smoking, high blood cholesterol levels, high blood pressure, physical inactivity, obesity, diabetes mellitus and stress. AHA also mentions that the risk factors listed latter can be treated, changed or modified and hence are called controllable risk factors.

According to Park and Park (1991), increasing age, masculine gender and a family history of premature heart diseases were the three powerful predictors of coronary heart disease, which are otherwise termed as modifiable risk factors.

### Age

Heart attacks are very rare in infancy and youth. John and Lee (1978) had assessed that CHD accounted for 41 per cent of the deaths in men aged 35 - 44 years and 52 per cent in men aged 45 - 54 years.

Data from the office of population consensus and surveys showed that CHD was the dominant cause of death in men after the age of 40. (Third report of a Joint Cardiology Committee, 1985).

According to Stamler et al. (1986), epidemiological data based on a large number of patients had now brought forth the view that the risk potential of lipids is a continuing one and it increases in a linear fashion in all adults with increasing age.

The estimated number of respondents with CHD over the 65 years was reported to be 3.6 million (National Center for Health Statistics, 1987 ).With aging, the plasma Low Density Lipoprotein (LDL) cholesterol level rises, which appears to be caused by over production of LDL with cholesterol feeding (Jonathan et al. 1987)

An increase in blood pressure with age is common and there is a linear relationship between diastolic blood pressure, CHD and stroke (Piper, 1996). According to AHA (1999), about four out of five people who die of CHD are of age 65 or older. At older ages, women who have heart attacks are twice as likely as men are to die from them

**Heredity**

According to John and Lavon (1984) persons with arteriosclerosis that is considered hereditary may have an abnormally high genetic requirement for particular nutrients that properly metabolize fats.

Friedlander et al. (1985) had found that in a random sample of 1044 men aged 40 - 70, the family history of heart attack before the age of 60 years was an independent risk factor for CHD. Heredity is extremely relevant in CHD. According to Norman (1989), the hereditability of raised serum cholesterol levels has been calculated as 35 - 40 per cent.

Ortega et al. (1994) found out that those descendants whose parents died of CHD had higher total fat, animal fat and saturated fat intakes and a lower Mono Unsaturated Fatty Acid (MUFA) value than descendants of those who died from other causes. Those with at least one parent who died of CHD had higher diastolic blood pressure and nutrient intakes less favourable from the cardiovascular risk point of view.

Davidson (1995) opined that family history of any disease might be either due to an inherited susceptibility or family sharing an atherogenic diet. Family history of premature IHD is a powerful predictor of heart diseases. (Riwayi, 1991). According to AHA (1999), children of parents with heart disease were more likely to develop it themselves.

**Gender**

Although atherosclerosis occurs both in males and females, males in general were found to be more predisposed to CHD, since the female sex hormones had an inhibitory effect on CHD (Antia, 1991).

Godsland et al. (1987) had found that the incidence of CHD was higher in men than in women due to difference in plasma lipoprotein risk factors between the sexes. Jacqueline et al. (1989) had reported that when oestrogen production stops either naturally or after removal of both ovaries, the risk of atherosclerosis was increased.

According to Bamji et al. (1996), men are more prone to heart attacks than women in pre-menopausal phase. Post-menopausally, the incidences are equal. Men suffer from about eight times the rate of CHD. Men have a greater risk of heart attack than women and they have attacks earlier in life. Even after menopause, when women's death rate from CHD increases, it is not as great as men's (AHA, 1999).

**Smoking**

Smoker's risk of heart attack is more than twice that of non-smokers. Cigarette smoking is the biggest risk factor for sudden cardiac death. Smokers who have a heart attack are more likely to die suddenly than non smokers [AHA, 1999]. Smoking habit is a well known determinant of leucocyte count (Hansen et al., 1990; Schwartz and Weiss, 1991; Yarnell et al., 1994). Gerard et al. (1989) found a positive association between plasma and apolipoprotein A and HDL markers by tobacco use.

Wendy et al. (1989) observed that the smokers as a group face an average overall excess risk of Coronary Artery Disease (CAD) of 70 per cent. Many studies have shown that the risk falls quite rapidly as soon as a person stops smoking, so that

five years after giving up smoking, an ex-smoker's risk is almost the same as that of a non-smoker. (Silagy et al., 1994).

The increased risk of CHD from smoking has been variously reported to be negligible in ex-smokers (Doll et al., 1994; Gramenzi et al., 1989). Thompson et al. (1995) are of the opinion that the increased risk of CHD in cigarette smokers may be partially explained by their less healthy diets and in particular by their lower intake of linoleic acid.

**Hypertension**

Hypertension is a strong risk factor for cardiac and blood vessel damage and is associated with high morbidity and mortality.

Elevated blood pressure has been shown to be a strong indicator of cardiovascular mortality (Cutler and Follman, 1997). Brian et al. (1989) and Ball (1988) founds that hypertension appear to accelarate atherosclerosis and a possible mechanism was by increasing intimal permeability.

People with uncontrolled hypertension have a higher incidence of CHD than others because longstanding hypertension causes damage and change in the arteries (Mishra and Kathen, 1995). Norman (1989) found that hypertension and elevated level of total cholesterol (TC) in the plasma were major risk factors for CHD.

In India, hypertension is becoming an important contributor to CVD and mortality. Reddy (1993) had predicted that by 2000 A.D, nearly 5 crore people would be affected by hypertension.

The British Regional Heart Study reports have shown that high blood pressure can double the heart'sunday workload, causing the heart to enlarge and weaken over time. It also increases congestive heart failure (Ghafoorunissa and Krishnaswami, 1995).

According to Barasi (1997) and Law (1997), reduction in diastolic levels that had been above 105mm Hg reduces the incidence of strokes.

Diabetes

Diabetes mellitus is one of the major hormonal disturbances that has profound influence on atherosclerosis (Datta, 1990). Franklin (1989) reported that the glyation of LDL may help to explain the increased susceptibility of diabetic subjects to atherosclerosis.

In a report of American Dietetic Association (1987), it has been stated that hypertension and diabetes were commonly associated. Diabetes mellitus is one of the major hormonal disturbances that has profound influence on atherosclerosis (Datta, 1990).

According to Rasmussen et al. (1992) diabetic patients with poor glycaemic control tend to have elevated serum lipoprotein levels that may well constitute a contributing factor to the high risk for atherosclerosis.

Complications of diabetes according to Loe (1993) include accelerated atherosclerosis, cardiovascular and peripheral vascular diseases as well as neuropathy and nephropathy.

In diabetes, blood lipids are increased and these contribute to premature or accelerated process of atherosclerosis. The prevalence of hypertension and heart disease is therefore higher in obese diabetics (Ghafoorunissa and Krishnaswami, 1995). Ischaemia caused by atherosclerosis is also reported to be more common among diabetic patients than non-diabetics (Sreenivas, 2000).

According to a study conducted by Paulose (2000) in Sri Uthradom Thirunal Hospital, Thiruvananthapuram, it was found that diabetic patients were three times more prone to heart attack, seven times more prone to hypertension and 20 times more prone to arterial occlussion than non-diabetics. He also explained that complications of diabetes if untreated will lead to catastrophic situations resulting in deaths due to CHD, gangrene,renal failure and blindness.

According to Jayakumar (2000), prevalence of hypertension, hyper-lipidemia and smoking in diabetes mellitus multiplies the risk of development of macrovascular diseases several fold.

## Obesity

Prospective studies have confirmed the moderate, but significant association between obesity and mortality related to CVD (Terry et al., 1992). As a general rule, there is positive correlation between the level of total body fat and that abdominal visceral adipose tissue in both men and women (Jean and Benoit, 1993).

According to AHA (1999), people who have excess body fat are more likely to develop heart disease and stroke even if they have no other risk factors. High levels of abdominal adipose tissue have been associated with elevated concentrations of plasma tri-acylglycerols as reported by Foster et al. (1987) and reduced concentrations of plasma HDL cholesterol (Anderson et al., 1988)

Barbara et al. (1987) found that in obese subjects, hyperinsulinemia induces over production of both Very Low Density Lipoprotein (VLDL) – apo B and VLDL triglyceride. According to Depress et al. (1990), the level of abdominal visceral adipose tissue has been reported to be the best correlation to lipoprotein ratios (HDL/LDL, HDL2/HDL3) used in the estimation of CVD risk.

According to Mansen and Colditz (1990), obesity is related to CVD since it adversely affects lipids. De Franzo and Ferrannini (1991) have reported that abdominal obesity and its related insulin - resistant state may represent better correlation of an elevated blood pressure than excess adipose tissue mass per se. Weight loss attenuates the HDL cholesterol lowering effect of very low fat diets and is

related in part to blunting the increase in triglyceride (TG) levels (Schaefer et al., 1995).

**Sedentary life and Exercise**

Recent evidences from prospective studies have confirmed the signi-ficant association between sedentary life and mortality related to CVD. Studies revealed that the incidence of IHD was high among those leading a sedentary life and low among individuals who lead an active life ( Swaminathan, 1995 ).

Physical inactivity was associated with an increased CHD risk and mortality, reports Ekelund et al. (1988) Wood et al. (1988) and William (1994) has reported that exercise favourably modifies plasma lipoproteins, lipid concentrations, insulin sensitivity and blood pressure. He had also reported comparable increase in HDL cholesterol in subjects with increased physical activity.

Exercise is a pre-requisite for health. Physiologically, it increases the electrical stability of the heart and decreases blood glucose, blood pressure and blood lipid levels. It increases HDL and reduces the tendency of clotting (Ghafoorunnisa and Krishnaswami, 1995). According to Wood (1996), any exercise unless overdone is good for the heart.

**Influence of diet on heart diseases**

Suiter and Hunter (1980) reported that diet treatment was preferable to exclusive use of drug treatment in atherosclerosis.

There is a close relationship between diet and chronic degenerative diseases. According to Chang and Dullov (1992), several constituents like energy intake, dietary fibre, sugar, salt and antioxidant nutrients link diet and heart disease.

Other dietary constituents such as the type of dietary carbohydrate, the intake of dietary fibre, calcium, vitamin A and vitamin D should be taken into account when studying the effect of manipulation of dietary fat on plasma cholesterol levels; reports Milton and Peggy (1987).

William (1989) has found that dietary factors responsible for atherosclerosis were the primary dietary constituents viz., carbohydrates, fats and proteins. Among the various factors which influence serum lipid levels, dietary factors are the most important, reports Kemppainen et al. (1993). A well balanced diet low in saturated fatty acid (SFA), total fat and cholesterol and a healthy lifestyle will lower the blood cholesterol levels and reduce the risk of heart disease in most people (Taylor, 1998).

**Carbohydrate**

According to Puddy et al. (1997), ingestion of a diet containing excess of calories in the form of refined carbohydrateleads to an elevated cholesterol and TG

levels. Populations consuming a high carbohydrate diet habitually have a low incidence of atherosclerosis and do not have markedly elevated plasma TG levels.

Prina et al. (1981) reported that the increased faecal exertion of cholesterol and bile acids induced by the gluten diet represents the main mechanism of the hypercholesterolemic effect of wheat gluten diet.

Liu et al. (1983) reported that low-fat, high - carbohydrate diets accentuate the metabolic risk factors for CHD, that were already present in patients with hypertriglyceridemia.

Too much sugar and refined carbohydrate consumption has been proved to be a major risk factor in atherosclerosis. Excess sugar and alcohol, not utilized as energy by the body eventually turn into saturated fat (John and Lavon, 1984). Gene and Minda (1988) reported that dietary glucose and fructose lowers the secretion of hepatic TG in rats fed on marine oil than in those fed with corn oil.

Kurup (1989) reported that sucrose produces the higher serum cholesterol when compared to glucose or corn starch. He had also observed that the beneficial effect of tapioca was irrespective of the nature of protein (casein or fish protein) or nature of fat (coconut oil or groundnut oil) in the diet.

A substitution of dietary fat for carbohydrates irrespective of the degree of saturation causes increase in HDL and decrease in TG (Mensik and Katan, 1992; Premakumari and Kurup, 1980).

**Protein**

Animal studies have shown that even a low-fat diet that is high in protein can promote the formation of coronary artery blockages. Rajammal et al. (1980) found that Gujarathi vegetarians who included much dairy products in their diet exhibited higher mean serum cholesterol levels when compared to Tamilian vegetarians.

Bernard et al. (1981) showed that the serum cholesterol and TG concentrations are lowered in a diet based on plant proteins at 13 per cent and 23 per cent respectively than a low cholesterol diet containing mixed protein from meat and dairy products.

Antonio et al. (1985) reported that the addition of soyabean protein to a standard low lipid diet was effective in inducing a significant decrease in cholesterol in patients with type II hyperlipoprotenemia.

Girija Devi (1985) has reported that in populations living on diets containing animal foods and dairy products, the serum cholesterol level and the incidence of heart diseases are high.

Susan et al. (1987) reported that whole legumes were effective cholesterol - lowering agents when consumed on a habitual basis.

Thorogood et al (1987) reported a lower cholesterol concentration in vegetarians than in those who eat meat, and that a vegetarian diet or a high intake of

fish were found to be associated with reduced risk of CHD. The non-vegetarians were at borderline risk levels for CVD with elevated serum total cholesterol and LDL cholesterol levels (Barasi, 1997).

Nalini and Radha (1989) suggested that dietary substitution of plant proteins for animal proteins can be used as a better regimen in combating hypercholesterolemia and hence CHD than the use of restricted fat diets.

Studies carried out by Saraswathydevi and Kurup (1989) on the effect of different pulses such as bengal gram, black gram, red gram, horse gram and green gram on the serum and aortic cholesterol levels revealed that blackgram, and to a lesser extent red gram, were found to cause significantly lower levels of aortic cholesterol, followed by horse gram and green gram. Bengal gram had no cholesterol - lowering effect.

Studies carried out by Kochar (2000) on the effect of additional intake of milk on blood pressure and plasma cholesterol revealed that creamless milk and its products had hypercholesterolemic effect only in hypertensive subjects and not in normotensive subjects.

**Lipids**

Swami (1989) reported that lipids are an important part of the disease process in patients with atheromatous vascular diseases. Ghafoorunissa (1992) remarked that

the quantity and quality of dietary fat alters serum lipid fractions, which in turn play an important part in the precipitation of CVD.

The exact risk potential of lipids in the atheromatous process has been established in coronary vascular diseases, as these are much more prevalent in areas with high lipid intake. (Grundy, 1989). Ehnholm et al. (1982) found that a diet rich in animal fat causes hypercholesterolemia.

It was the proportion of SFA to Poly Unsaturated Fatty Acid (PUFA) in the diet that determines the lipid level and consequently the vascular deposition of lipids (Krause, 1984). According to the reports of NIN (1985), the type and amount of fat consumed is an important factor in the occurrence of CVD.

Levy (1985) gave striking correlation between average fat intake and average levels of serum cholesterol. He also reported a direct correlation between the intake of SFA on one hand and the incidence of CAD and hypercholesterolemia on the other.

The magnitude of the the increase in plasma TG following a meal (post-prandial lipaemia) is recognised to be an important risk maker for CHD (Dubois et al., 1998). and Chen et al.,1993).

The associated risk of CHD appears to be related to the persistence of remnant particles derived from the chylomicrons that carry the dietary TG into the plasma (Karpe et al., 1994). These may represent the actual 'atherogenic particle' (Weintraub et al., 1996).

Many factors are known to influence the magnitude of postprandial lipaemia, including age and sex (Cohn et al., 1988), obesity (Lewis et al., 1990) and diabetes (Akanji et al., 1992) and the amount of fat in the test meal (Dubois et al., 1998). All these factors affect the response quantitatively rather than qualitatively. The total fat intake may be closely linked with the activity of clotting factor VII and thus play a role in the aetiology of heart diseases.(Stringer et al., 1989).

Rao et al. (1987) reported that the mode of consumption of fat also appears to influence the elevation of cholesterol in blood. At the same level of total daily intake, consumption of smaller amounts of fat, a number of times during a day, has been shown to cause less consumption of the same total daily fat intake at one time a day.

Etherton et al. (1988) opines that SFA and cholesterol raise the plasma cholesterol levels, where as PUFA lowers it.

Merk and Lynne (1988) reported that there was significant positive correlation between consumption of saturated fat and cholesterol and international mortality from CHD.

Mensik and Katan (1992) reported a positive correlation between high SFA intake and elevated serum cholesterol concentrations. Braunwald (1988) reported that in patients whose calories are met by fats, the chances of developing atheroma appear to be high.

Mary et al. (1988) had found out that low fat intakes resulted in lower TC and lower HDL cholesterol and lower HDL cholesterol levels. Weber and Leaf (1994) after conducting experimental studies on animals have indicated that the substitution of omega -6 (n – 6) as well as omega-3 (n – 3) fatty acids for saturated fat in the diet seems to reduce the frequency of episodes of cardiac arrhythmia.

Troisi et al. (1992) reported that peroxidised lipids may be important in atherogenesis and suggested that peroxidised lipids may provide an index of the severity of atherosclerosis.

Hassel (1994) reported that linoleic acid can reduce serum cholesterol levels independent of other dietary effects. Thompson et al. (1995) reported that linoleic acid, a major constituent of PUFA in the diet, is inversely associated with the risk of CHD.

**Omega - 3 - fatty acids**

Recent studies on fats and oils have shown that n-3 fatty acids are the most healthful. The fact that fishes are rich sources of n-3 fatty acids is of great interest to Keralites, because fish is a regular food in our diets.

Mahmond et al. (1994) reports that fish oil, the long chain n-3 PUFA namely eicosapentaenoic acid (20 : 5n-3) and decosahexaenoic acid (22:6n-3) are the active

components in lowering plasma lipid levels. Rao (1987) has ascertained that some marine oils, especially sardine oil rich in PUFA has a cholesterol - lowering action.

Studies conducted at National Institute of Nutrition (NIN) indicated that the change in the blood lipids and platelet aggregation showed a dose - related response when supplemented with the fish oil. Even a low habitual intake of fish, equivalent to one or two dishes a week, may be of value in the prevention of CHD (Ghafoorunisa, 1992 ; Johnsen and Seljeflot, 1999).

Sri Lakshmi (1999) reported that in Eskimos who consumes 400 g 0f fish daily, the incidence of atherosclerosis is low. Ascherio et al. (1995) reported that dietary n-3 PUFA abundant in marine organisms may reduce the development of CVD.

Consumption of fish and fish oil with eicosapentaenoic acid and decosahexaenoic acid lowers the cholesterol and TG levels in hyperlipidemics (Tillotson et al., 1997; Wahlqvist and Dalais, 1999).

**Cooking oil**

The oil to be used for cooking is a subject of great concern since a few decades. Levy (1985) studied the effect of different edible oils - sesame oil, ricebran oil, corn oil, butter fat and hydrogenated fat - on aortic cholesterol. He observed that the hydrogenated fat and butter fat produced severe lesions, while coconut oil and groundnut oil produced moderate lesions.

Mark (1987) reported that ghee contains cholesterol which is atherogenic. Baggio et al. (1988) reported that olive oil enriched diet decreases TC, total apoprotein B, LDL cholesterol and total TG.

Blackburn et al. (1988) reported that coconut oil appears to be neutral in terms of any effect on serum cholesterol. He opined that coconut oil is not hypercholesterolemic when consumed as a part of mixed fat diet.

According to studies conducted by Charul and Vasanthamani (1998), groundnut oil brought about a significant reduction in all the lipid fractions such as TC, VLDL and serum TG at 1 per cent level of significance. Reductions in LDL levels were significant at 5 per cent level. The results coincide with those of Glueck et al. (1989) and Mensik et al. (1995) who concluded that replacement of SFA in diet with MUFA brought about positive changes in the plasma lipid levels. Substitution of sunflower oil and gingely oils decreased the TC levels. These results match with those of Chanderbhan et al. (1997), Burr (1989) and Wood et al. (1994).

Studies by Ramadas and Easwaran (2000a) on the influence of different plant oil on serum lipid levels revealed that plant oil consumed in desired level did maintain normal serum lipid fractions. Though the adults consuming coconut oil had a high mean value of TC of 208 mg/dl, the HDL level was 54.5 mg/dl which was the highest compared to those consuming groundnut oil, gingely oil, sunflower oil, ghee etc.

Coconut kernel and fish form an integral part of diet of coconut oil consumers among vegetarians and non-vegetarians respectively in Kerala. When coconut kernel was abstained from the diets of coconut oil consumers for 30 days, the TC and LDL levels in male vegetarians increased by 0.8 and 1.8 mg.dl which may be attributed to the absence of fibre from coconut kernel. However the increase was not statistically significant. Contrary to this, among female vegetarians, the levels of TC, LDL and TG decreased by 2.6, 5.8 and 1.0 mg/dl. When fish was withdrawn, the TC and LDL levels increased in both sexes, while VLDL remained the same. Hence population groups consuming coconut oil can have the oil consumption of 30 g/day with the inclusion of coconut kernel / fish in their diet (Ramadas and Easwaran, 2000b).

Research findings indicate that the short and medium chain fatty acids present in coconut oil, rapidly absorbed , digested and assimilated in the human body will not cause blood abnormality which are usually associated with the consumption of SFA from other sources

Ghafoorunissa (1992) remarks that the quantity and quality of dietary fat alter serum lipid fractions, which in turn play an important role in the precipitation of CVD.

PUFA reduces the serum concentrations of lipids while SFA causes the inverse to occur in both normal and hyperlipidemic individuals. Saturated fats in the diet increase blood levels of cholesterol (Jackson et al., 1994 and Bayr et al., 1992).

Research has shown that the most effective defense against high blood cholesterol levels is through an eating pattern that is low in fat, especially saturated fats and dietary cholesterol (American Dietetic Association, 1987).

According to Barnard et al. (1997), participants in the resident components of the Pritikin Longevity programme had similar responses. Their diets contained less than 10 per cent of calories from fat (<3% saturated) and 35- 40 g of dietary fiber per day. Investigators estimated that TC was further reduced by 19 per cent within 3 weeks as a result of diet. Very low fat diets increase TG levels regardless of whether the diet is high in simple or complex carbohydrate (Surwit et al., 1997), but the increase may be attenuated by high dietary fibre intake or weight loss (Schaefer et al., 1995).

**Fibre**

The effect of dietary fibre on chronic degenerative diseases is a topic of great concern recently. Regular intake of dietary fibre at appropriate levels is reported to be effective in counteracting many of the risk factors associated with CHD such as increased apolipoprotein B which increases LDL cholesterol, elevated serum cholesterol levels, high levels of blood serum fibrinogen, hypertension, obesity and diabetes (Singh et al., 2000) Dietary fibre is significantly associated with plasma total & LDL cholesterol. Additional high fibre intake is positively correlated with HDL level.(Ludwig et al., 1999). Different forms of fibre have different effects on serum

cholesterol level and mainly soluble fibres help to reduce total & LDL cholesterol levels, reports Chadha *et al.* (1997).

The effects of CHD can be substantially alleviated by the increased consumption of dietary fibre (Anderson *et al.*, 1990). He found out that significant reduction in blood pressure was achieved using fibre-rich diets. One of the possible reasons could be the high contents of calcium and magnesium in dietary fibre, which are effective in reducing hypertension (Shills 1988 and Luft *et al.*, 1989).

Soluble dietary fibre supplementation of diet reduces serum hypercholesterolemia significantly (Bell *et al.*, 1990). Jean and George (1983) had reported that a high fibre diet reduces the serum cholesterol level.

According to Robert (1994) factors such as meat, fat and sucrose consumption with low fibre intake may increase the development of CHD.

Insoluble fibre sources like wheat bran does not lower blood cholesterol levels, but viscous types like pectin and guargum in large doses lower plasma TC and LDL cholesterol levels (Nutrition News, 1986). Oat products were found to be most efficient due to their high B-glucan content (Anderson *et al.*, 1990). According to Richard *et al.* (1991), 3-26% reduction in plasma TC was observed with an intake of 40 -75 oat bran per day.

Robert (1994) had shown that dietary supplementation with pectin increases excretion of faecal fat, sterols and bile acids. Jean et al. (1987) had reported that combinations of pectin and cereal brans in the diet could be useful in normalizing cholesterol and TG of patients suffering from hyperlipidemia.

Lybius et al. (1985) had found that intake of pectin, cellulose and lignin significantly altered serum TC, TG, HDL / TC ratio in normolipidemic subjects over four weeks.

According to Vadhera et al. (1995) the fibre from the outer skin of onion and garlic lowered total lipids, TC and TG of respondents. Horigome et al. (1992) has reported that freeze dried banana pulp showed a marked cholesterol lowering effect when incorporated into a diet.

"When eaten on a regular basis as part of a low-fat, low-cholesterol diet, soluble fibre has been shown to reduce blood cholesterol (AHA, 1999)

AHA recommends the use of Water Soluble Dietary Fibre (WSDF) and Fructo Oligo Saccharide (FOS) as two dietary factors of fibre nature, vital to a healthy heart. Studies with guar gum, locust bean gum, pectin, oat bran, legumes and psyllium have all shown significant cholesterol - lowering effects (Clevidence et al., 1992). In a clinical study by Stanford researchers, it was demonstrated that a mixture of WSDF sources can be practically incorporated into the diet resulting in significant cholesterol - lowering within four weeks (AHA, 1999).

FOS are naturally occuring sugars used as food additives due to their flavour and sweetness - enhancing properties. FOS are non-digestible by humans and may possess some dietary fibre-like functions since they cause a decline in the hydrolysis of sucrose and maltose. Health benefits reported to be associated with FOS include a reduction in serum TG and cholesterol. (AHA, 1999)

**Beverages**

Thelle et al. (1983) reported that frequent coffee consumption was positively associated with TC and TG value in both sexes and was inversely associated with HDL cholesterol values in women. Srimathi et al. (1981) reported that both coffee and tea appears to cause an increase in serum lipids and lipoproteins.

The consumption of decaffeinated coffee was also found to increase the level of LDL cholesterol. (Truswell, 1994 and Kark et al., 1985) have indicated an association between coffee intake and increased levels of serum cholesterol in men and women.

Michael (1994) reported that flavanoid intake may reduce elderly men's risk of dying from CHD. Tea contains 61 per cent flavanoids.

Alcoholic beverages such as whisky, brandy, rum, wine, beer etc. increases blood pressure, weakens the heart muscle and leads to a pathological condition known as alcoholic cardiomyopathy (Ghafoorunnisa and Krishnaswamy, 1995).

Alcohol is a source of empty calories and can be turned into fat, adding weight to the body. It increases the level of TG.

Michael et al. (1986) reported that alcohol produces a rise of 1 per cent in serum HDL, probably due to a rise in the HDL sub fraction. But Ornish et al. (1998) opines that alcohol consumption raises the HDL3 fraction, and not HDL2, which is supposed to be beneficial to the heart.

Low or subnormal LDL levels were reported to be another characteristic of the lipoprotein pattern in chronic alcoholics (Marja et al., 1987).

The hardness of drinking water is closely related to CHD (Chrombie et al., 1989) Hardness of water is associated with higher calcium and a lower mortality from CVD (Antia, 1991). John and Lee (1978) reported that the hardness of drinking water has been correlated with cardiovascular mortality. The softer the water, the higher the death rates.

**Other dietary factors**

Although the major nutrients play a major role in the occurrence and reversal of cardiac diseases, there are certain other nutrients and food items which may be important in this aspect.

Magnesium deficiency may lead to coronary arteriosclerosis and the levels of magnesium in the blood have been reported to be inversely correlated with the severity of CAD.

Milton and Peggy (1987) reported that increased intake of dietary calcium reduces the plasma cholesterol levels. Sheela (1988) had reported that inclusion of garlic in the daily diet significantly decreased serum cholesterol and TG and increased HDL levels. Sheila and Easwaran (1989) showed the hypocholesterolemic effect of garlic and onion in the raw form.

Guyvalette et al. (1984) found that the defatted position of fenugreek seeds induced a hypocholesterolemic effect . The hypocholesterolemic effect of fenugreek seeds was also studied by Sharma (1989a). Fenugreek seeds increased the escretion of bile acids and neutral sterols and depletion of cholesterol stores in the liver.

Fenugreek seeds contain hypocholesterolemic components that appear to be saponins that interact with bile salts in the digestive tract and exhibit a strong inhibitory effect on the bile salt absorption. A diet containing fenugreek seeds may result in reductions of serum TC, LDL and VLDL cholesterol, and TG levels without altering HDL cholesterol.

Garlic, vitamin C, vegetarian diets, unsaturated fatty acids, potassium and n-3 fatty acid lowers blood pressure (Anuradha and Gayathri, 1999).

**Salt**

Excessive salt consumption has been linked to hypertension or high blood pressure. In most parts of the world, 10 to 20 per cent of the adults have high blood pressure.

Decrease in salt intake is perhaps the single largest factor in the treatment of hypertension. Cutting salt in diet leads to a fall in blood pressure, but 3 to 4 kg is permitted (Riwari, 1991).

Supplementation of low sodium salt (LoNa) showed a marked decrease in systolic and diastolic blood pressure. At the same time, lowering of sodium is of no help in altering the blood lipid profile (Amrithaveni and Srividhya, 1999).

**Spirulina**

Spirulina, a multicellular filamentous cyanobacterium, belonging to algae of class cyanophyta, has been established as a highly nutritious food. It contains 350 per cent more potassium than rice. Potassium activates many enzymes that are essential for muscle contraction. It helps in the maintenance of normal blood pressure (Anuradha and Gayathri, 1999).

Spirulina acts directly upon lipid metabolism by preventing accumulation of fats and cholesterol (Seema Arora, 1996).

Spirulina supplementation significantly reduces the TC, TG, LDL and VLDL without any decrease in body weight or blood pressure. (Anuradha and Vidhya, 2000).

**Antioxidants**

Oxidative free radicals and lipid peroxidation are commonly believed to play a major role in atherogenesis.(Cadilla, 2000 and Yagi, 1987).

Studies done by Balz Frei (1995) supports the oxidation hypothesis of atherosclerosis, implicating oxidative modification of LDL as an important etiologic event in the development of CVD. The limitation of LDL oxidation in vivo by increased dietary intake or supplementation of nutrient antioxidants may be an effective means of lowering the incidence of CHD.

Vitamins C and E are important natural antioxidants that inhibit lipid peroxidation and a high intake of these vitamins, particularly vitamin E, is related to a reduced incidence of IHD. Supplemental vitamin E can increase arterial compliance over a relatively short time period. This may be one factor contributing to the inverse relation between vitamin E intake and CAD (Cadilla., 2000).

Stampfer (1995a) reported a highly significant trend for lower risk of CHD with high intake of vitamin E. Humann (1994) has quoted several studies linking vitamin C to a decreased risk of cancer, heart diseases and cataracts.

Plasma antioxidant status, especially vitamin C status is inversely related to most of the classic risk factors of CHD like high serum glucose, high serum lipid profiles and smoking. Increasing plasma vitamin C status by eating more of vitamin C rich foods can reduce the incidence of CHD via reduction in risk factors (Sinha and Sharma, 1998).

Vitamin E may be a potent anti-atherogenic nutrient, protecting the cells against oxidative injury (Henning and Boissoneault, 1988).

Since some synthetic antioxidants have adverse physiological effects on human body, much attention in recent years has been put towards natural antioxidants (Dinesh et al., 2000).

**Standardisation of recipes**

Standardisation of recipe is an essential strive for high quality products (Crussius, 1984). According to Tolule (1984), the procedure for recipe standardisation began with the process of recipe modification or adjustment. A standardised recipe means that the recipe has been tested and retested so that the ingredients, the proportions and the methods for combining all the ingredients always provide the same results.

Standardisation and the quality management systems play a major role in the assimilation of technology, effecting economy in production and stimulating competitiveness. It encapsulates technological results and becomes a vehicle for technology transfer, while quality is the key for facilitating trade and satisfying customers (Sohrab, 2000).

**Reversal Diet**

Reversal diet is the modification of normal diet to slow down the progress of heart diseases. Standardisation of reversal diet and preparation of ready reckoner are of great significance to cardiac patients, dietitians, doctors and to the public.

Dr. Dean Ornish, MD, President of the Preventive Medicine Research Institute in Sausalito, California, has conducted a series of studies to see if a comprehensive programme of intensive life style changes can have a positive impact on the progression of CHD.

Pritikin (1984), the most outspoken advocate of diet therapy in the management of circulatory diseases proved through his own death that atherosclerosis was indeed reversible. 25 years ago, he learned that his own coronary arteries were seriously obstructed. Through a vigorous programme of diet and exercise, he was able to reduce his cholesterol level from 300 mg per cent to between 100 - 130 mg per cent and to keep it there for 25 years.

Castelli (1986) through the famous Framingham Heart Study observed that diet could reverse CAD in 90 per cent of the cases, if the cholesterol level could be attained below 150 mg.

Ornish's treatment for patient with CHD is a demanding regimen:

(1) It includes a vegetarian diet with less than 10 per cent of calories from fat, with minimal amounts of saturated fat.

(2) Moderate exercise is prescribed for each respondent, usually a walking programme.

(3) A diet that excludes fleshy foods and stimulants and permits the use of non-fat milk, moderate salt and sugar and high fibre.

(4) The treatment relies on the daily use of stress - management techniques including various stretching, breathing, meditation, yoga and relaxation exercises.

(5) Patients receive group support and psychological counselling to identify sources of stress and strain and receive tools that help them to manage stress more effectively.

(6) Smokers participate in a smoking-cessation programme.

In 1992, Orinish found that the 22 respondents who had followed his programme for four years, on the average, showed fewer blockages in their arteries and improved blood flow to their hearts. The 18 respondents in the "usual care" group, on

the average, got worse. They showed more blockages in their arteries after four years than after one year, and less blood flow to their hearts.

Dr Dean Ornish has developed two diets - (1) The Reversal Diet is for people with known heart disease, who want to reverse its effects and lower their heart attack risk. (2) The Prevention Diet is recommended for people who do not have heart disease, but whose cholesterol levels are above 150 mg/dl without cholesterol - lowering medication, or for people with a ratio of TC to HDL that is less than 3.0.

**Foundation of Dr. Dean Ornish's diets: -**

The foundation of Dr. Ornish's claims about the relationship between diet and heart disease rests on several principles.

(i) Each gram of fat contains nine kilocalories, while protein and carbohydrates contain four kilocalories per gram. A person can essentially eat more food on a very low-fat diet since fewer calories are consumed in each meal.

(ii) "Eating fat makes you fat" and causes heart disease. Fat that is ingested by the body is easily converted into body fat. Complex carbohydrates - the staple of low-fat diets - are less easily converted to body fat.

(iii) Saturated fat is converted to cholesterol by the liver and the blood cholesterol level is increased, while MUFA and PUFA do not raise cholesterol levels.

(iv) The Reversal diet is geared towards those people with known heart diseases. It is a vegetarian diet, consisting mostly of complex carbohydrates.

Vegetarian foods do not contain cholesterol as in animal products, and they are low in saturated fat (except avocados, nuts, seeds, cocoa and coconut) Dr. Dean Ornish's summary of the diet is listed below

(i) has less than 10 % of calories from fat and little of it is saturated.

(ii) excludes foods rich in saturated fat

(iii) is high in fibre

(iv) allows less than 2 ounces of alcohol per day

(v) excludes all oils and all animal products except non-fat dairy / yoghurt.

(vi) allows egg whites

(vii) excludes caffeine, other stimulants and Mono Sodium Glutamate (MSG)

(viii) allows moderate use of salt and sugar

According to Dr. Ornish, Reversal Diet is comprised of :

- 10 per cent of fat, most of which is polyunsaturated or monounsaturated
- 70 per cent to 75 per cent carbohydrates
- 15 per cent to 20 per cent protein
- 5 mg cholesterol daily

**The Prevention Diet**

Dr Ornish writes that a person is probably already eating an adequate diet to protect from heart disease if the following conditions are met : if a person's choleserol level is under 150 mg/dl, and he/ she is not taking cholesterol - lowering medication, or if one's ratio of TC to HDL is less than 3.0

If these conditions are not met, then a person may decrease the amount of saturated fat and cholesterol in the diet, beginning by eating a diet that has less than 20 per cent fat. After eight weeks, if a new cholesterol test does not show a reduction in cholesterol to the target level of 150, more foods high in saturated fats and cholesterol can be eliminated. The Reversal Diet can be used as a guide in eliminating foods. If the target level cannot be achieved through diet alone, other methods will have to be pursued such as exercise and stress reduction.

**Diet Counselling**

Clara (1986) reported that diet counselling is necessary to lower the blood lipids and to maintain the normal levels in atherosclerotic patients.

Kasim et al. (1993) reported that as a result of diet counselling, fat intake was reduced from 36 per cent to 18 per cent of calories, and body weight was reduced by 2.6 kg over a one year period.

Theusen et al. (1986) provided dietary counselling to achieve a low fat diet and followed up every 2 weeks for 3 months, He then asked the subjects to maintain the very low - fat diet for an additional 9 months. Participants reduced the total fat intake to 10 per cent of calories after 3 months and experienced an 8.7 kg weight loss.

Sheppard et al. (1991) reported that intensive instruction to maintain a low - fat diet resulted in reduction of fat intake from 39 per cent to 22 per cent of calories and was accompanied by a 3 kg weight loss at six months.

# MATERIALS AND METHODS

# 3. MATERIALS AND METHODS

A study was undertaken at College of Agriculture, Vellayani during 1998-2000, to standardise reversal diets for cardiac patients and to assess its impact on the lipid profile of cardiac patients. The materials and methods adopted for the study are as follows:

3.1. Standardisation of reversal diets

3.2. Diet counselling to the patients and

3.3. Evaluation of the impact of reversal diet

## 3.1 Standardisation of reversal diets

Reversal diet is the modification of the normal diet to slow down the progress of heart diseases. Major principles observed in the experiment for planning reversal diets are:-

i. Inclusion of plant foods and exclusion of animal foods.

ii. Exclusion of foods rich in saturated fats as well as foods with more than 10 per cent calories from fat.

iii. Exclusion of stimulants.

iv. Restriction in sugar and salt.

### 3.1.1 Planning diet chart

Based on the above principles, guidelines listed below were drafted and used for planning the diet chart of reversal diets. These guidelines were communicated to the subjects (patients attending the cardiology O.P. of Medical College Hospital - Thiruvananthapuram, Al-arif Hospital - Ambalathara and P.R.S. Hospital - Killippalam), so as to make them vigilant about foods, nutrition-conscious and oriented towards health fitness.

* A mixture of oils instead of any single oil, to keep the polyunsaturated/ saturated fatty acid ratio (P/S ratio) between 0.8 and 1.

* Elimination of animal foods.

* Frequent inclusion of skim milk, yoghurt and pulses to ensure protein needs.

* Restriction of stimulants like alcoholic beverages, cola and coffee since they suppress the body's ability to burn fat.

* Limiting the use of salt and sugar to bring out the subtle flavour of dishes.

* Inclusion of fresh salads with vegetables, green leafy vegetables and fruits daily to ensure dietary fibre.

* Inclusion of vegetable soups/citrus fruits/fruit juices to meet mineral/vitamin requirements.

* Selection of carbohydrate - rich foods.

* Abstaining foods rich in dehydrogenated fats and oils.

* Exclusion of trigger foods, junk foods, snacks and finger foods.

* Preference for simple preparations using methods like stir-frying, braising, poaching, blanching, steaming and boiling.

* Significance of seasonal availability, regional preferences and cost control of the food ingredients.

### 3.1.2 Identification and selection of foods

An outline of the suitable foods and their proportion in the daily diet are outlined as Reversal Diet Pyramid (Fig. 1).

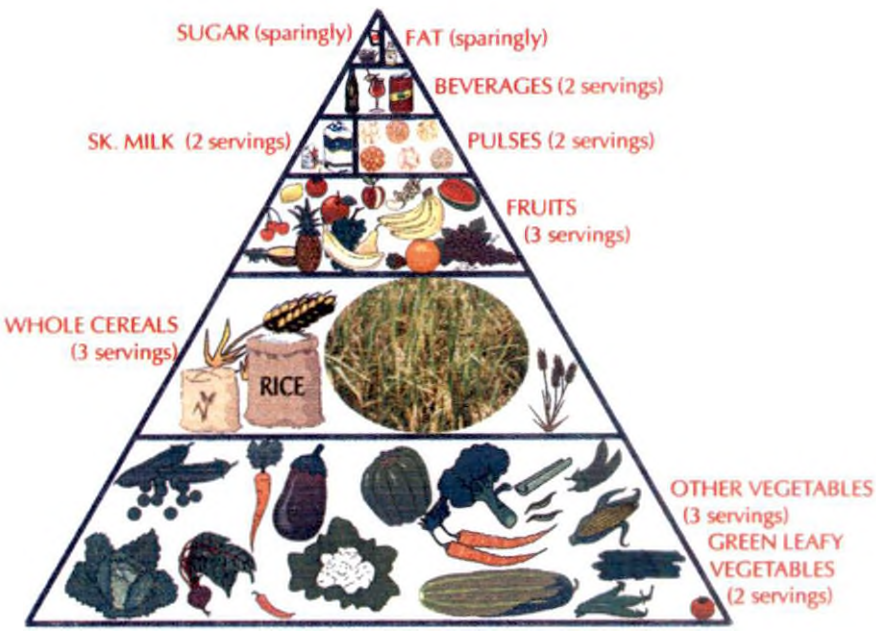


**Fig. 1. Reversal Diet Pyramid**

i) An important constituent of reversal diet was fibre. The diet chart was planned to contain as much as 40g of dietary fibre per day since the effects of CHD can be substantially alleviated by increased consumption of dietary fibre (Anderson et al., 1990). In order to achieve a high fibre diet, foods like whole cereals (3 servings) and pulses (2 servings), green leafy vegetables (2 servings), other vegetables (3 servings) and fruits (3 servings) were included in large quantities in the diet. Less familiar foods like kuskus and oats were also incorporated as cereal items. Preference were given to dals (split), unrefined wheat flour, unstrained vegetable soups and defated cocount.

ii) Presence of protective nutrients such as vitamins and trace elements was well ensured in the daily diet by including fresh salads with vegetables like carrot, cucumber, tomato, radish and onion.

iii) Fat was the major nutrient restricted in the diet. For this, vegetable soups in which fat was replaced by tomato puree, fat - free citrus fruits/fruit juices/green leafy vegetables and defatted coconut scrapings were included in the regular meal pattern.

iv) A mixture of oils- polyunsaturated fatty acid, monounsaturated fatty acid and saturated fatty acid in the ratio 2:1:1- was recommended. In this experiment,

a mixture of sunflower oil (2 portions), gingely oil (1 portion) and coconut oil (1 portion) were mixed. As indicated in fig.1, fat was used only sparingly.

v) Protein is another nutrient which was included in the reversal diet. Skim milk, which contains 33.5 per cent protein, when compared to whole milk which has only 3.87 per cent, was included in the diet to meet the protein needs along with pulses like soyabean, green gram, bengal gram, red gram dal, black gram and green peas.

vi) Different plant foods were suggested depending on their seasonal availability, regional preferences, cost and local availability.

vii) The use of fleshy foods was avoided in the reversal diet since they are rich in cholesterol and saturated fats.

viii) Steaming and boiling were the major cooking methods adopted along with stir-frying and braising to curtail the use of oil in the recipes.

ix) Breakfast is important since it regulates hunger during the day. Unlike breakfast and dinner, lunch was made rich with side dishes like salads and legume preparations. Dinner was planned as to be the lightest meal of the day being the end of daily biological cycle. It was proposed to serve dinner at least two hours before going to bed in order to facilitate digestion.

x) Too much of sugar was avoided in order to cut down the calories and to keep the glycaemic index f the diet a low level. Similarly, excess salt was also

restricted to prevent the elevation of blood pressure and further physiological degeneration.

xi) The use of stimulants was restricted in the diet because of their adverse effect on the heart. Weak tea, which contains only 70 mg of caffeine and also rich in flavanoids, was included. Other stimulants like alcoholic beverages and cola were also restricted.

### 3.1.3 Standardisation of recipes

A standardized recipe is one that will produce the same quality product and consistent yield every time it is prepared and by everyone who prepares the recipe. The procedure for standardization of recipes in this experiment included:

i) Listing of ingredients required for each recipe with their quantity.

ii) Quantifying the ingredients of each recipe in indigenous household measures like cups, spoons and katories.

iii) Deciding the steps in cooking with reference to the stage of addition of ingredients, heat application and time needed.

iv) Cooking the dishes according to the procedure, observing meticulously the time needed for cooking stages of addition of each ingredient and finalizing the preparation.

Each recipe selected was standardized in the laboratory on the above lines. Every single recipe was prepared three to four times to arrive at uniformity and to obtain optimum results. The prepared dishes were weighed and the cooked weights were also recorded subsequently. The following number of recipes were standardized in this order:

| | | |
|---|---|---|
| Breakfast items - 7; | Lunch - 7; | Dinner - 7 |
| Sidedishes - 30; | Beverages - 7; | Snacks - 6 |

### 3.1.4 Formulation of seven days menu

Using the developed recipes, a seven days menu was formulated. Long-range menus made it easier to avoid the monotony of repeating the recipes. The menu was planned in such a manner as to include five moderate meals instead of three heavy meals (Appendix I).

### 3.1.5 Computation of nutritive value of the diet

The nutritive value of the planned diets were assessed through computation with the aid of food composition tables (Rao et al., 1999). The total amount of calories, fat, protein and fibre were computed.

### 3.1.6 Preparation of ready reckoner

After standardization, a ready reckoner for the benefit of patients/spouses was formulated which explained in detail about the constituents of each day's menu, with reference to raw ingredients used, method of cooking and the cooked volume of the products (Appendix II). A diet exchange list was also formulated (Appendix III) to ensure variety and individual nutritional requirements. General instructions to be followed to prepare the recipes were also detailed in the ready reckoner.

Quantity of each item in the menu was worked out with respect to the total calorie per day to be supplied. Three types of diets supplying 1000, 1250 and 1500 Kcals were planned for each day in the seven day's menu, with the expectation of prescribing the same for patients according to variation in body weight and severity of body weight of heart disease.

This gave an indication about the energy density of each dish included in the menu and also ways of reducing calorie content of the daily diet by inclusion and exclusion of specific dishes.

### 3.2 Diet counselling to the respondents

The major objective of dietary counselling was to educate the participants about the nature of the disease, its hazards, and how it can be recognized and

prevented or controlled through diet (Srilakshmi, 1999). Advice on personal hygiene, individual instructions on diet and any specific therapy for individual respondents, were also included during counselling.

### 3.2.1 Selection of hospitals

Three hospitals from Thiruvananthapuram city viz., Medical College Hospital, PRS Hospital and Al-arif Hospital were selected for the study. These three hospitals had separate cardiac clinics and the patients attending these clinics were the participants in the counselling.

### 3.2.2 Selection of samples

Hundred and fifty patients (fifty from each hospital) were selected through simple random sampling. Prior to counselling, information related to their residence, their contact with the cardiologist and the blood lipid profile were collected.

To elicit preliminary information regarding the socio-economic, dietary pattern and lifestyle of the respondents, a suitably structured questionnaire was developed (Appendix IV) and administered by the investigator.

**Socioeconomic profile**

The socioeconomic profile consisted of details regarding the family size, type of family; education and occupation of family members, total monthly income and percentage of monthly income spent on food and health care.

**Dietary pattern**

Details regarding the inclusion of a food item in meals per week by the respondent as well as the total quantity of the particular food consumed were recorded. Data regarding the quantity of oil used were collected. The average calorific value, TFA, SFA and cholesterol content of their daily diet were computed.

**Lifestyle**

Lifestyle pattern of the patients such as the use of alcohol, beedi, cigarette, snuff etc. were recorded. Data regarding the habit of doing exercise as well as the different stress and strain of the patients were also collected.

**3.2.3 General dietary counselling**

After collecting the above-mentioned data, all the patients were given a general counselling regarding diet and heart disease, foods to be restricted and the significance of a diet exchange list. The counselling was conducted with the permission of the hospital authorities for the benefit of all the patients attending the cardiac clinic.

### 3.2.4 Adoption rate of patients

Rogers (1962) defined adoption process as the mental processes through which an individual passes from first hearing about an innovation to its final adoption.

For the measurement of rate of adoption of the reversal diet, a checklist containing ten statements pertaining to the principles of reversal diet was formulated and administered to the respondents selected for the counselling. Each statement was given two response categories viz., `adopted' and `not adopted' with the scores `one' and `zero' respectively (Appendix V). Based on this checklist, the researcher had made a non-participant observation before the counselling and the scores were compared with those taken three months after the counselling. The difference between the initial and final scores indicate the rate of adoption of the gained knowledge.

### 3.2.5 Intensive diet counselling

Out of the hundred and fifty respondents who were selected for the study, thirty respondents who satisfied the following inclusion criteria were selected for intensive counseling.

**Inclusion criteria**

i. Patient's willingness

ii. Higher adoption rate

iii. Uniform medication

iv. Severity of the disease

**Fig. 2. Intensive diet counselling**

Intensive diet counselling was given to thirty patients - ten each from a clinic. A suitable day was fixed for counselling and the selected patients were informed by sending post cards.

The counseling programme included the following sessions:-

i. Pre-test

ii. Lecture

iii. Demonstration

iv. Question-answer session

v. Post-test

The counselling was conducted in a common place for two consecutive days (2 hours a day) for the selected thirty respondents.

On the first day, the programme started with a pre-test to assess the extent of awareness of the patients about diet and heart disease. This session lasted for 30 minutes. This was accomplished with the help of a suitably structured schedule. Seventy statements on the topic `diet and heart disease' were prepared and ranked by teachers and students. The first fifty statements were selected and included as the checklist for conducting `pre-test' and `post-test' (Appendix VI). For assessing the knowledge on diet and cardiac disease among the sub-sample, a check list of 50 statements pertaining to the above topic were prepared. The main purpose of these statements was to test the awareness of the respondents among the subjects before the counselling programme. The statements were administered to 30 respondents and they

were requested to give their reactions to each statement either as `agree' or `disagree'. `Agree' and `disagree' were given respectively the scores 1 and 0. The total score of a respondent could be obtained by summing up the weights of individual items responded. The schedule included positive and negative statements related to food habits, diet and cardiac diseases, risk factors of heart disease, different types of oil and their effect in the occurrence of heart diseases.

Following this a detailed lecture was given which lasted for an hour. The lecture covered topics such as:

* diet in the management of heart diseases
* significance of the modified diet (reversal diet)
* quantity of foods to be consumed per day
* steps in cooking (modified)
* importance of diet chart
* selection of foods that are easily available, nutritionally dense and suitable for the cardiac patients.

In order to supplement the lecture, demonstration was carried out. Audiovisual aids were developed which included

* Charts on the quantity of foods to be consumed.
* Posters to visualize the procedures in cooking and food selection.

**Fig. 3. Prepared reversal diet**

Prepared diet (as shown in Fig. 2) was exhibited and the mixed oil samples (as stipulated in 3.1.2.iv) were distributed to the patients. A diet chart comprising of seven day's menu, ready reckoner to facilitate ease in cooking and a booklet on 'Diet and Heart Disease' (Appendix VII) were provided to the patients after the lecture. This session lasted for 30 minutes.

On the second day, question-answer session with the patients were conducted. Clarification for the doubts raised by the patients about :-

* The significance of reversal diet.
* The difference between the normal diet and the modified diet.
* The role of High Density Lipoprotein (HDL) and Low Density Lipoprotein (LDL) in the precipitation of CVD.
* Foods rich in cholesterol.
* Taste of the mixed oil.

This session lasted for 90 minutes.

After the question-answer session, 'post-test' was conducted. The schedule used for conducting 'pre-test' was again made use of. The subjects were requested to put a tick mark ( ✓ ) against 'Agree' or 'Disagree' which they thought to be the apt one. The maximum score attainable by a respondent through this test would be 50. The difference in score between the `pre-test' and the `post-test' indicated the rate of

awareness as well as the gain in knowledge after the counseling. This session lasted for 30 minutes.

The patients were requested to follow the modified diet strictly for a period of three months. A log book was provided to record any deviation made in the diet.

During the period, the respondents were regularly contacted through personal visit, correspondence and phone-calls by the investigator. Doubts were clarified and solutions were sought for problems regarding the modified diet as and when required.

After three months, the blood samples were again collected and estimated for blood lipid profile to study the variation that occurred in the liquid profile due to the reversal diet.

### 3.3 Evaluation of impact of the reversal diet

The impact of the introduction of reversal diet was assessed with reference to

i. Rate of adoption of the diet
ii. Gain in knowledge
iii. Change in blood lipid profile

### Statistical Analysis

Statistical interpretation of the data included mean, standard deviation, correlation and simple percentage analysis. Inter correlation between the variables was

also calculated. The three parameters mentioned above were statistically analysed using suitable tests. The data thus analysed is presented in results and discussion.

i. Rate of adoption of the diet

The percentage of knowledge adopted was calculated using the formula

$$\frac{T_2-T_1}{T} \times 100$$

where $T_1$ is the score obtained before the counselling

$T_2$ is the score obtained after the counselling

and T is the maximum attainable score (10)

ii. Gain in knowledge

Low, medium and high knowledge scores were assessed by calculating standard deviation ($\sigma$) and mean (X). Knowledge score (X) is said to be low if x is less than $\bar{x} - \sigma$ ($x < \bar{x} - \sigma$), medium if x is between $\bar{x} - \sigma$ and $\bar{x} + \sigma$ and high if x is greater than $\bar{x} + \sigma$ ($x > \bar{x} + \sigma$).

iii. Change in blood lipid profile

Inorder to find out whether there is any significant difference in blood lipid profile before and after intensive diet counselling, paired t-test was done using the formula,

$$t = \frac{X\sqrt{N}}{S} \quad \text{where} \quad S = \frac{(X - \bar{X})^2}{N - 1}$$

where $X$ is the mean score of deviations

$\bar{X}$ is the difference between initial and final blood lipid values.

N is the number of patients and

S is the standard deviation of deviations

# RESULTS

# 4. RESULTS

The present study entitled "**Standardisation of reversal diets for cardiac pateints**" was undertaken to assess the impact of reversal diet on the blood lipid profile of cardiac patients through diet counselling. The results of the study are presented under the following heads.

4.1 Standardisation of reversal diets.

4.2 Nutritive value of the standardised diets.

4.3 Socioeconomic profile of the respondents.

4.4 Dietary pattern of the respondents.

4.5 Lifestyle pattern of the respondents.

4.6 Blood lipid profile of the respondents.

4.7 Association of dietary and non-dietary factors with blood lipid profile and

4.8 Conduct of diet counselling

4.9 Evaluation of the impact of the reversal diet.

## 4.1 Standardisation of reversal diets

As the first step of the study, seven types of breakfast, lunch, dinner, beverages and six types of snacks were standardised in the laboratory, observing the principles of 'Reversal Diet'.

Table 1 Distribution of ingredients used for the standardised breakfast recipes

| Sl. No. | Breakfast | Ingredients | 1000 KCal | 1250 KCal | 1500 Kcal | Salt used (g) | Visible fat used (g) | Method of cooking |
|---|---|---|---|---|---|---|---|---|
| 1) | Idiappam | Rice flour | 60 | 70 | 80 | 1 | - | Steaming |
| | Tomato-dal mashed | Tomato | 50 | 60 | 70 | 1 | 1 | Boiling and sauting |
| | | Red gram dal | 5 | 7 | 10 | - | - | |
| 2) | Oats porridge | Oats | 30 | 40 | 50 | - | - | Boiling |
| | | Skimmed milk powder | 10 | 15 | 20 | - | - | |
| | Boiled banana | Ripe banana | 60 | 80 | 100 | - | - | Steaming |
| 3) | Paratha | Wheat flour | 50 | 65 | 75 | 1 | - | |
| | Veg.kurma | Beans | 20 | 30 | 40 | 2 | 1 | |
| | | Carrot | 20 | 30 | 40 | - | - | |
| | | Big onion | 20 | 30 | 40 | - | - | Boiling |
| | | Coconut | 5 | 7 | 10 | - | - | |
| 4) | Barley | Barley | 30 | 40 | 50 | - | - | Boiling |
| | | Skimmed milk powder | 10 | 15 | 20 | - | - | |
| | | Sugar | 5 | 10 | 10 | - | - | |
| | Boiled banana | Ripe banana | 60 | 70 | 80 | - | - | Steaming |
| 5) | Puttu | Rice flour | 40 | 50 | 60 | 1 | - | |
| | | Coconut | 3 | 5 | 7 | - | - | Steaming |
| | Green peas curry | Green peas, dry coconut | 20 | 25 | 30 | 2 | - | |
| | | Coconut | 5 | 10 | 10 | - | - | Boiling |
| 6) | Idli | Rice, raw | 30 | 40 | 50 | 1 | - | Steaming |
| | | Black gram dal | 10 | 20 | 30 | - | - | |
| | Sambar | Red gram dal | 20 | 25 | 30 | 2 | 1 | |
| | | Cucumber | 20 | 30 | 40 | - | - | Boiling |
| | | Small onion | 20 | 30 | 40 | - | - | |
| | | Ladies finger | 25 | 35 | 45 | - | - | |
| 7) | Kuskus porridge | Kuskus | 30 | 40 | 50 | - | - | Boiling |
| | | Skimmed milk powder | 10 | 15 | 20 | | | |
| | Boiled banana | Banana, ripe | 60 | 70 | 80 | - | - | Steaming |

Table 1 shows the distribution of ingredients used for the standard breakfast recipes. About 40 to 80 g of cereals, 60 to 120 g vegetables, 60 to 100 g fruits, 10 to 30 g pulses and 10 to 20 g skimmed milk powder were used for a day's breakfast. The amount of salt and visible fat used varied from 1-2 g. Steaming and boiling were the main cooking methods adopted.

Table 2 Quantified distribution of ingredients in the standardised recipes for lunch

| Sl. No. | Recipes | Ingredients | 1000 KCal | 1250 KCal | 1500 Kcal | Salt used (g) | Visible fat used (g) | Method of cooking |
|---|---|---|---|---|---|---|---|---|
| 1) | Rice | Rice | 40 | 50 | 60 | - | - | Boiling |
| | Amaranth-dal curry | Amaranth | 20 | 30 | 40 | 2 | 1 | |
| | | Red gram dal | 15 | 20 | 25 | - | - | Boiling |
| | Veg.soup | Carrot | 20 | 40 | 60 | 2 | 1 | |
| | | Beans | 15 | 25 | 40 | - | - | Boiling |
| | | Potato | 20 | 30 | 40 | - | - | |
| | | Beetroot | 20 | 30 | 40 | - | - | |
| | | Corn flour | 5 | 7 | 10 | - | - | |
| | Tomato-carrot salad | Tomato | 15 | 25 | 40 | - | - | |
| | | Carrot | 20 | 30 | 40 | - | - | - |
| | | Onion | 15 | 25 | 40 | - | - | |
| 2) | Lime rice | Rice | 40 | 50 | 60 | - | 2 | Boiling |
| | | Lime juice | 5 | 7 | 10 | - | - | |
| | Cowpea pugath | Cowpea | 20 | 30 | 40 | 2 | 1 | Boiling and |
| | | Coconut | 5 | 7 | 10 | 2 | 1 | sauting |
| | Buttermilk | Buttermilk | 100 | 150 | 200 | 1 | -- | - |
| | Carrot-cucumber salad | Carrot | 20 | 30 | 40 | - | - | |
| | | Cucumber | 20 | 40 | 60 | - | - | - |
| | | Onion | 20 | 30 | 40 | - | - | |
| 3) | Red gram dal rice | Rice | 30 | 40 | 50 | 2 | 1 | Boiling |
| | | Red gram dal | 15 | 20 | 25 | - | - | |
| | Pulissery | Cucumber | 20 | 40 | 60 | 1 | 1 | Boiling |
| | | Curd | 50 | 100 | 150 | | | |
| | | Coconut | 5 | 7 | 10 | | | |

Table 2 continued

| Sl. No. | Recipes | Ingredients | 1000 KCal | 1250 KCal | 1500 Kcal | Salt used (g) | Visible fat used (g) | Method of cooking |
|---|---|---|---|---|---|---|---|---|
| | Chekkurmanis pugath | Chekkurmanis | 20 | 30 | 40 | 1 | - | |
| | | Coconut | 5 | 7 | 10 | - | - | Sauting |
| | Carrot-radish salad | Carrot | 20 | 30 | 40 | - | - | |
| | | Radish | 20 | 40 | 60 | - | - | - |
| | | Onion | 15 | 25 | 35 | - | - | |
| 4) | Rice | Rice | 40 | 50 | 60 | - | - | Boiling |
| | Green gram pugath | Green gram | 20 | 25 | 30 | 2 | - | Boiling and |
| | | Coconut | 5 | 7 | 10 | - | - | sauting |
| | Rasam | Tomato | 25 | 35 | 50 | 1 | 1 | Boiling |
| | Avial | Cucumber | 10 | 20 | 40 | 2 | 2 | Boiling |
| | | Snakegourd | 10 | 20 | 40 | - | - | |
| | | Raw banana | 10 | 20 | 40 | - | - | |
| | | Drumstick | 10 | 20 | 40 | - | - | |
| | | Clusterbeans | 5 | 15 | 25 | - | - | |
| | | Brinjal | 5 | 10 | 20 | - | - | |
| | | Yam | 10 | 20 | 30 | - | - | |
| | | Green chilli | 5 | 7 | 10 | - | - | |
| | | Coconut | 5 | 7 | 10 | - | - | |
| 5) | Rice | Rice | 40 | 50 | 60 | - | - | Boiling |
| | Sambar | Red gram dal | 15 | 25 | 30 | 2 | 1 | Boiling |
| | | Small onion | 20 | 30 | 40 | - | - | |
| | | Cucumber | 20 | 40 | 60 | - | - | |
| | | Ladies finger | 20 | 30 | 40 | - | - | |
| | | Brinjal | 20 | 30 | 40 | - | - | |
| | Drumstick leaves pugath | Drumstick leaves | 20 | 30 | 40 | 1 | 1 | Sauting |
| | | Coconut | 5 | 7 | 10 | - | - | |
| | Tomato-carrot salad | Tomato | 20 | 40 | 60 | - | - | - |
| | | Carrot | 25 | 30 | 50 | - | - | |
| | | Onion | 20 | 30 | 40 | - | - | |
| 6) | Mixed veg. pulao | Raw rice | 40 | 50 | 60 | 1 | 1 | Boiling |
| | | Green peas | 20 | 25 | 30 | - | - | |
| | | Carrot | 20 | 40 | 60 | - | - | |
| | | Beans | 10 | 20 | 30 | - | - | |
| | | Big onion | 15 | 20 | 25 | - | - | |
| | Cucumber raita | Cucumber | 20 | 30 | 40 | 1 | - | Boiling |
| | | Curd | 50 | 100 | 150 | - | - | |

Table 2 continued

| Sl. No. | Recipes | Ingredients | 1000 KCal | 1250 KCal | 1500 Kcal | Salt used (g) | Visible fat used (g) | Method of cooking |
|---|---|---|---|---|---|---|---|---|
| | Cabbage thoran | Cabbage | 20 | 30 | 40 | 2 | 1 | Sauting |
| | | Coconut | 5 | 7 | 10 | - | - | |
| 7) | Rice | Rice | 40 | 50 | 60 | - | - | Boiling |
| | Green gram - | Green gram | 15 | 25 | 35 | 2 | 1 | Boiling |
| | pumpkin | Pumpkin | 30 | 40 | 60 | - | - | |
| | curry | Coconut | 5 | 7 | 10 | - | - | |
| | Amaranth | Amaranth | 25 | 35 | 45 | 1 | 1 | Sauting |
| | pagath | Coconut | 5 | 7 | 10 | - | - | |
| | Tomato- | Tomato | 50 | 60 | 75 | - | - | - |
| | cucumber | Cucumber | 20 | 60 | 75 | - | - | |
| | salad | Onion | 15 | 20 | 25 | - | - | |

Each day's menu for lunch included 40 to 60 g of rice, 15 to 40 g pulses, 20 to 45 g leafy vegetables, 100 to 200 g other vegetables and 5 to 10 g coconut along with salt and 1 to 3 g fat. Boiling and sauting were the cooking methods adopted. The details are presented in Table 2.

Table 3 Quantified distribution of ingredients used in the standardised dinner recipes

| Sl. No. | Dinner | Ingredients | 1000 KCal | 1250 KCal | 1500 Kcal | Salt used (g) | Visible fat used (g) | Method of cooking |
|---|---|---|---|---|---|---|---|---|
| 1) | Broken wheat | Wheat, broken | 40 | 50 | 60 | - | - | Boiling |
| | gruel | Skimmed milk powder | 10 | 20 | 30 | - | - | |
| | Carrot | Carrot | 40 | 50 | 60 | 1 | 1 | Sauting |
| | pugath | Coconut | 5 | 7 | 10 | - | - | |
| | Orange | Orange | 50 | 60 | 75 | - | - | - |
| 2) | Wheat dosa | Wheat flour | 40 | 45 | 50 | 1 | 1 | Toasting |
| | Cauliflower | Cauliflower | 30 | 40 | 50 | 2 | 2 | Boiling |
| | curry | Big onion | 20 | 30 | 40 | 2 | 2 | |
| | Milk | Skimmed milk powder | 15 | 20 | 25 | - | - | - |
| | | Sugar | 5 | 7 | 10 | - | - | |
| 3) | Rice gruel | Rice | 40 | 45 | 50 | 1 | - | Boiling |
| | Green gram thoran | Green gram | 20 | 25 | 30 | 1 | - | Boiling |
| | Tomato- | Tomato | 50 | 60 | 75 | - | - | |
| | cucumber | Cucumber | 40 | 60 | 80 | - | - | - |
| | salad | Onion | 20 | 30 | 40 | - | - | |
| 4) | Chapathi | Wheat flour | 50 | 55 | 60 | 1 | 1 | |
| | Soyabeans | Soyabeans | 15 | 20 | 25 | 2 | 1 | Boiling |
| | curry | Coconut | 5 | 7 | 10 | - | - | |
| | Plantain | Plantain | 50 | 60 | 75 | - | - | - |
| 5) | Dosa | Raw rice | 35 | 40 | 45 | 1 | 2 | Toasting |
| | | Black gram dal | 10 | 15 | 20 | - | - | |
| | Tomato-dal | Red gram dal | 20 | 25 | 30 | 1 | - | Boiling and |
| | mashed | Tomato | 40 | 50 | 60 | - | - | sauting |
| 6) | Puttu | Raw rice | 40 | 50 | 60 | 1 | - | Steaming |
| | | Coconut | 3 | 5 | 7 | - | - | |
| | Green gram boiled | Green gram | 20 | 25 | 30 | 1 | - | Boiling |
| | Plantain | Plantain | 50 | 60 | 75 | - | - | |
| 7) | Oats porridge | Oats | 30 | 35 | 40 | - | - | Boiling |
| | | Skimmed milk | 10 | 15 | 20 | | | |
| | Steamed banana | Banana, ripe | 60 | 80 | 100 | - | - | Steaming |

Table 3 represents the quantity wise distribution of ingredients used in the standardised dinner recipes. Wheat was the main cereal used, followed by rice and oats. About 40 to 60 g of wheat flour 10 to 30 g pulses, 30 to 80 g vegetables, 50 to 100 g fruits, 3 to 10 g coconut and 15 to 25 g skimmed milk powder were used along with 1 to 3 g of salt and fat. Braising was the major cooking method adopted..

The quantitified distribution of ingredients used for the standard recip.es for beverages is presented in Table 4. The ingredients used for standardising fruit and vegetable-based beverages varied according to the fruit used. 10 to 20 g of skimmed milk powder and 10 to 30 g sugar were used for standardising tea along with 3 to 5 g of tea dust. The amount of sugar used for fruit/vegetable juices varied from 5 to 40 g. About 150 to 300 g of vegetables/fruits were used.

Table 4 Distribution of ingredients used in the standardised beverages

| Beverages | Ingredients | 1000 KCal | 1250 KCal | 1500 Kcal |
|---|---|---|---|---|
| Tea | Skimmed milk powder | 10 | 15 | 20 |
| | Tea dust | 3 | 4 | 5 |
| | Sugar | 10 | 20 | 30 |
| Carrot juice | Carrot | 150 | 200 | 250 |
| | Sugar | 5 | 7 | 10 |
| Buttermilk | Buttermilk | 200 | 200 | 300 |
| Tomato juice | Tomato | 150 | 200 | 250 |
| | Sugar | 10 | 15 | 20 |
| Lime juice | Lime extract | 5 | 10 | 15 |
| | Sugar | 20 | 30 | 40 |
| Pineapple juice | Pineapple | 200 | 250 | 300 |
| | Sugar | 5 | 7 | 10 |
| Tender coconut water | Tender coconut water | 200 | 300 | 400 |

Table 5 Quantified distribution of ingredients used in the standardised snack preparations

| Snacks | Ingredients | 1000 KCal | 1250 KCal | 1500 Kcal | Salt used (g) | Visible fat used (g) | Method of cooking |
|---|---|---|---|---|---|---|---|
| Biscuit | Arrowroot biscuit | 1.5 | 2 | 2.5 | | | |
| Sundal | Bengal gram | 30 | 35 | 40 | 2 | 1 | Boiling |
| | Coconut pieces | 5 | 10 | 15 | | | |
| Ada | Rice flour | 20 | 25 | 30 | - | 1 | Steaming |
| | Coconut | 5 | 7 | 10 | | | |
| | Jaggery | 5 | 10 | 15 | | | |
| Veg.sandwich | Bread | 2 | 2.5 | 3 | 1 | 1 | Toasting |
| | Carrot | 15 | 20 | 25 | | | |
| | Beans | 10 | 15 | 20 | | | |
| | Onion | 15 | 20 | 25 | | | |
| French toast | Bread | 1 | 2 | 3 | - | - | Toasting |
| | Milk powder, skimmed | 5 | 7 | 10 | | | |
| | Sugar | 5 | 7 | 10 | | | |
| Rice flakes | Rice flakes | 25 | 30 | 35 | 1 | 1 | Santing |
| Upma | Coconut | 5 | 7 | 10 | | | |

About 1½ to 2 ½ arrowroot biscuits, 30 to 40 g bengal gram for sundal, 20 to 30 g rice flour for ada, 1 to 3 slices of bread, 40 to 70 g vegetables, 5 to 10 g skimmed milk powder and sugar, 25 to 35 g rice flakes and 5 to 10 g coconut were used. The amount of salt and fat used in each recipe ranged from 1 to 2 g. Steaming, toasting and boiling were the cooking methods adopted. The details are illustrated in Table 5.

## 4.2 Nutritive value of the standardised diets

The major nutrients such as energy, protein and fat of the standardised recipes were computed using the food composition table. The fibre content of the recipes, which is beneficial to the patient, was also computed.

The energy content of the standardised breakfast recipes for 1000 Kcal diet ranged between 220 and 235 Kcals, for 1250 Kcals between 246 and 254 Kcals and for 1500 Kcal diet between 272 and 283 Kcals. As far as protein content is concerned, it varied between 9.5 and 14.2 g for 1000 Kcal diet. The fat content of the standardised breakfast recipes varied between 0.58 and 2.81 g for 1000 Kcal diet, between 0.7 and 5.3 g for 1250 Kcal diet and between 1.1 and 7.6 g for 1500 Kcal diet. Regarding the fibre content, for 1000 Kcal diet, the values ranged between 1.5 and 4.1 g; for 1250 Kcal diet, between 2.3 and 6.0 g and between 3.7 and 8.1 for 1500 Kcal diet. The details are presented in Table 6.

Table 6 Energy, protein, fat and fibre contents of the standardised breakfast

| Sl. No. Recipe | Energy | | | Protein | | | Fat | | | Fibre | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal |
| 1. Idiappam, Tomato dal mashed | 234 | 252 | 280 | 14.2 | 16.5 | 18.1 | 1.44 | 2.88 | 4.01 | 1.5 | 2.3 | 3.8 |
| 2. Oats porridge, Boiled banana | 235 | 254 | 283 | 12.7 | 14.9 | 17.0 | 2.47 | 4.9 | 6.5 | 2.9 | 3.9 | 5.0 |
| 3. Paratha, vegetable kurma | 220 | 246 | 272 | 9.5 | 11.3 | 14.1 | 2.81 | 5.3 | 7.6 | 3.7 | 4.8 | 6.1 |
| 4. Barley porridge, boiled banana | 227 | 250 | 276 | 10.0 | 12.9 | 14.3 | 0.58 | 0.7 | 1.1 | 3.0 | 4.6 | 6.1 |
| 5. Puttu, green peas curry | 234 | 252 | 280 | 10.1 | 12.5 | 14.9 | 2.54 | 3.7 | 5.1 | 1.8 | 2.8 | 3.7 |
| 6. Idli, Sambar | 230 | 248 | 278 | 12.2 | 14.0 | 15.8 | 2.10 | 4.8 | 7.3 | 2.3 | 3.8 | 5.0 |
| 7. Kuskus, porridge, Boiled banana | 232 | 251 | 280 | 12.0 | 14.5 | 16.3 | 2.50 | 5.1 | 6.3 | 4.1 | 6.0 | 8.1 |

Table 7. Energy, protein, fat and fibre contents of the standardised lunch

| Sl.No. Recipe | Energy | | | Protein | | | Fat | | | Fibre | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal |
| 1. Rice Amaranth dal curry, veg. soup, tomato-carrot salad | 281 | 302 | 321 | 10.5 | 12.7 | 15.0 | 2.66 | 3.9 | 4.8 | 4.2 | 5.8 | 7.4 |
| 2. Lime rice Cowpea pugath, Carrot-cucumber salad, buttermilk | 273 | 297 | 316 | 10.3 | 12.5 | 14.7 | 5.33 | 7.12 | 9.3 | 3.9 | 5.3 | 6.9 |
| 3. Red gram dal rice, Pulissery, pugath, carrot-radish salad | 285 | 305 | 327 | 9.6 | 12.0 | 14.6 | 6.54 | 8.2 | 10.0 | 4.9 | 6.5 | 8.1 |
| 4. Rice, green gram pugath, rasam, avial | 280 | 301 | 323 | 10.2 | 12.3 | 14.9 | 3.20 | 4.0 | 4.8 | 4.5 | 6.0 | 7.5 |
| 5. Rice, Sambar Drumstick leaves pugath, Tomato-carrot salad | 283 | 309 | 330 | 9.0 | 11.3 | 13.2 | 3.51 | 4.7 | 5.8 | 3.5 | 5.0 | 6.7 |
| 6. Mixed vegetable pulao, Cucumber raita, cabbage thoran | 286 | 302 | 326 | 8.9 | 11.5 | 13.8 | 4.39 | 5.3 | 7.0 | 3.9 | 5.4 | 8.3 |
| 7. Rice, Green gram pumpkin curry Amaranth pugath, tomato-cucumber salad | 282 | 303 | 328 | 8.1 | 11.3 | 13.7 | 2.63 | 3.5 | 4.7 | 4.6 | 6.5 | 8.3 |

Approximately 230 to 280 Kcals, 9 to 17 g protein, 1 to 10 g fat and 3 to 15 g fibre was provided.

As depicted in Table 7, the energy content of the standardised lunch varied from 273 to 286 Kcals for 1000 calorie diet where as for 1250 Kcals diet, it varied from 297 to 305 and for 1500 calorie diet, it was between 316 to 330. In the case of protein, the 1000 Kcals diet provided about 8.1 to 10.5 g from lunch; for 1250 calorie it was between 11.3 to 12.7 g and for 1500 calorie the protein content varied from 13.2 to 15 g. As far as the fat content of lunch was concerned, it varied from 2.6 to 5.4 g for 1000 calorie diet, where as the variation was between 3.9 to 8.2 g for 1250 calorie diet and for 1500 calorie diet it was between 4.7 to 9 g. The fibre content of the lunch varied between 3.5 to 5.0 g for 1000 calorie diet, 5.0 to 6.5 g. for 1250 calorie diet and 6.7 to 8.3 g. for 1500 calorie diet.

Table 8 Energy, protein, fat and fibre contents of the standardised dinner

| Sl.No. | Energy | | | Protein | | | Fat | | | Fibre | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal |
| 1) Broken wheat gruel, Carrot pugath. Orange | 232 | 251 | 273 | 10.2 | 12.5 | 15.0 | 2.51 | 3.6 | 4.8 | 5.1 | 6.3 | 8.1 |
| 2) Wheat dosa, Gopi masala, Skimmed milk | 231 | 250 | 271 | 10.5 | 12.7 | 15.2 | 3.81 | 4.9 | 5.8 | 3.2 | 5.3 | 7.4 |
| 3) Rice gruel, green-gram boiled, Tomato-cucumber salad | 230 | 249 | 270 | 9.7 | 11.3 | 13.7 | 1.41 | 2.6 | 3.8 | 3.6 | 5.5 | 7.4 |
| 4) Chapathi, Soyabeans curry, Plantain | 231 | 258 | 280 | 12.5 | 15.0 | 17.2 | 6.40 | 8.3 | 10.2 | 5.8 | 7.2 | 9.6 |
| 5) Dosa, tomato-dal mashed | 233 | 249 | 272 | 9.2 | 11.5 | 13.9 | 3.56 | 4.7 | 6.1 | 3.1 | 5.0 | 7.1 |
| 6) Puttu, green gram boiled, plantain | 234 | 252 | 275 | 10.1 | 12.3 | 14.9 | 2.10 | 3.3 | 4.5 | 2.9 | 4.2 | 6.3 |
| 7) Oats porridge, steamed banana | 235 | 247 | 271 | 12.7 | 14.9 | 16.0 | 2.47 | 3.6 | 5.0 | 3.0 | 5.0 | 7.0 |

The energy content of the standardised recipes for dinner ranged between 230 and 235 Kcals for 1000 Kcal diet, between 247 and 258 Kcals for 1250 Kcal diet and between 270 and 280 Kcals for 1500 Kcal diet. The protein content ranged between 9.2 and 12.7 g for 1000 Kcal diet, between 11.3 and 15 g for 1250 Kcal diet and between 13.7 and 17.2 g for 1500 Kcal diet. Regarding the fat content of the standardised diet, for 1000 Kcal diet, the values ranged between 1.41 and 6.40 g; for 1250 Kcal diet between 2.6 and 8.3 g and for 1500 Kcal diet between 3.8 and 9.6g.

As far as the fibre content was concerned, it varied between 2.9 and 5.8 g for 1000 Kcal diet, between 3.3 and 7.2 g for 1250 Kcal diet and between 3.7 and 8.6 g for 1500 Kcal diet. Details are depicted in Table 8.

Table 9 Energy, protein, fat and fibre contents of the standardised beverages

| | Energy | | | Protein | | | Fat | | | Fibre | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal |
| Tea | 80 | 133 | 189 | 4 | 6 | 8 | 0.1 | 0.15 | 0.2 | - | - | - |
| Carrot juice | 92 | 124 | 160 | 1.4 | 1.8 | 2.3 | 0.3 | 0.40 | 0.5 | 1.5 | 2.4 | 3.0 |
| Buttermilk | 30 | 38 | 45 | 1.6 | 2.0 | 2.4 | 2.2 | 2.8 | 3.3 | - | - | - |
| Tomato juice | 70 | 100 | 130 | 1.4 | 1.8 | 2.3 | 0.3 | 0.4 | 0.5 | 1.2 | 1.6 | 2.0 |
| Lime juice | 43 | 61 | 79 | 0.1 | 0.2 | 0.3 | 0.05 | 0.1 | 0.15 | 0.07 | 0.13 | 0.2 |
| Pineapple juice | 112 | 142 | 172 | 0.8 | 1.0 | 1.2 | 0.2 | 0.25 | 0.3 | 1.0 | 1.3 | 1.5 |
| *Tender coconut* water | 48 | 72 | 96 | - | - | - | - | - | - | - | - | - |

As depicted in Table 9, the standardised beverages provided about 30 to 112 Kcals for 1000 Kcal diet, between 38 and 142 Kcals for 1250 Kcal diet and between 45 and 172 Kcals for 1500 Kcal diet. The protein content varied from 0.1 to 4.0 g for 1000 Kcal diet, between 0.2 and 6.0 g for 1250 Kcal diet and between 0.3 and 8.0 g for 1500 Kcal diet. Regarding fat, all the values were negligible except in the case of buttermilk, where the values were 2.2, 2.8 and 3.3 g for 1000, 1250 and 1500 Kcal diets. The fibre content of the beverages ranged between 0.07 and 1.5 g for 1000 Kcals diet, between 0.13 and 2.4 g for 1250 Kcal diet and between 0.2 and 3.0 g for 1500 Kcal diet.

Table 10 Energy, protein, fat and fibre contents of the standardised snacks

| Sl. No. | Recipe | Energy | | | Protein | | | Fat | | | Fibre | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal | 1000 Kcal | 1200 Kcal | 1500 Kcal |
| 1. | Arrowroot biscuilt | 180 | 225 | 270 | 2 | 3 | 4 | 5 | 6 | 7.60 | 3.1 | 3.8 | 4.5 |
| 2. | Sundal | 150 | 182 | 205 | 5 | 6 | 7 | 2 | 2.6 | 3.12 | 4.2 | 6.4 | 8.6 |
| 3. | Ada | 172 | 210 | 241 | 2 | 3 | 4 | 3 | 4.1 | 4.70 | 3.8 | 4.4 | 5.0 |
| 4. | Vegetable sandwich | 109 | 138 | 172 | 3 | 4 | 5 | 3.5 | 4.1 | 4.70 | 4.9 | 6.3 | 7.7 |
| 5. | French toast | 115 | 143 | 180 | 4 | 5 | 6 | 4.3 | 5.4 | 6.60 | 3.6 | 4.8 | 6.0 |
| 6. | Rice flakes upma | 100 | 131 | 170 | 3 | 4 | 5 | 3.2 | 4.6 | 6.00 | 3.2 | 4.4 | 5.6 |

The total amount of energy, protein, fat and fibre in the standardised snacks is presented in Table 10.

The energy content of the snacks varied between 100 and 180 Kcals for 1000 Kcal diet, between 131 and 225 Kcals for 1250 Kcal diet and between 170 and 270 Kcals for 1500 Kcal diet. Regarding the protein content, the values ranged between 2 and 5 g for 1000 Kcal diet, between 3 and 6 g for 1250 Kcal diet and between 4 and 7 g for 1500 Kcal diet. The fat content of the snacks varied from 2 to 5 g for 1000 Kcal diet, between 2.6 and 6 g for 1250 Kcal diet and between 3.12 and 7.6 g for 1500 Kcal diet. As far as fibre was concerned, the values ranged between 3.1 and 4.9 g for 1000 Kcal diet, between 3.8 and 6.4 g for 1250 Kcal diet and between 4.5 and 8.6 g for 1500 Kcal diet.

### 4.3 Socio-economic profile of the respondents

Preliminary information regarding the socio-economic background, dietary and lifestyle pattern of 150 respondents were elicited and the results are presented below.

The socio-economic profile consisted of details regarding age, sex, religion, type of family, family size, monthly income and occupation of the respondents.. Table-11 depicts the distribution of respondents based on their age, sex, religion, type and size of the family.

Table 11 Distribution of respondents according to age, sex, religion, type and size of the family

| Sl.No. | Characteristics | Category | Number (%) | |
|---|---|---|---|---|
| | | | (Male) | (Female) |
| 1. | Age | < 30 years | 6 (6.5) | 8 (13.8) |
| | | 30 - 60 years | 49 (33.3) | 32 (55.2) |
| | | > 60 years | 37 (40.2) | 18 (32.0) |
| | | Total | 92 (100) | 58 (100) |
| 2. | Sex | Male | 92 (61.3) | |
| | | Female | 58 (38.7) | |
| 3. | Religion | Hindu | 90 (60) | |
| | | Christian | 25 (17) | |
| | | Muslim | 35 (23) | |
| 4. | Type of family | Nuclear | 122 (81.3) | |
| | | Joint | 28 (18.7) | |
| 5. | Family size | 1-4 members | 85 (56.7) | |
| | | 5-8 members | 65 (43.3) | |

Figures in parenthesis indicates percentage.

There were 6 (6.5%) male respondents and 8 (13.8%) female respondents under the age of 30 years. Maximum respondents were in the age range of 30 to 60 years, in which 49 (53.3%) were males and 32 (55.2%) were females. There were 37 (40.2%) males and 18 (32%) females in the age group above 60 years.

Out of the 150 respondents, 92 (61.3%) were males and 58 (38.7%) were females.

Regarding religion, 90 (60%) respondents were Hindus, 25 (17%) were Christians and 35 (23%) were Muslims.

From among the 150 respondents surveyed, 122 (81.3%) were from nuclear while 28 (18.7%) were from joint families. Similarly there were 85 (56.7%) respondents, whose family size was less than or equal to four, while 65 (43.3%) respondents had 5 to 8 members in their family.

Table 12 Distribution of families according to their monthly income

| Monthly income range (Rs.) | Numbers | Percentage |
|---|---|---|
| ± 1000 | 6 | 4 |
| 1001-2000 | 45 | 30 |
| 2001-3000 | 28 | 18.7 |
| 3001-4000 | 15 | 10 |
| 4001-5000 | 24 | 16 |
| 5001-6000 | 15 | 10 |
| 6001-7000 | 2 | 1.3 |
| 7001-8000 | 2 | 1.3 |
| > 8000 | 13 | 8.7 |
| Total | 150 | 100 |

The economic status of the family is presented in Table 12. The data on total monthly income revealed that 45 (30%) families had income between Rs.1001 to 2000, followed by 28 (18.7%) in the range of Rs.2001 to 3000, 24 (16%) in the range 4001 to 5000, 15 (10%) between 3001 to 4000, 15 (10%)) in the range 5001 to 6000. Only 13 (8.7%) families were rich, who had income above Rs.8000 per month.

Table 13 Distribution of respondents based on their employment status

| Employment status | Distribution of respondents | |
|---|---|---|
| | Numbers | Percentage |
| Government employee | 26 | 17 |
| Private employee | 38 | 25 |
| Self employed | 26 | 17 |
| Retired | 50 | 34 |
| Unemployed | 10 | 7 |
| Total | 150 | 100 |

Table 13 shows the distribution of respondents based on their occupation. Out of the 150 respondents, 26 (17%) were government employees, 38 (25%) worked in private concerns, 26 (17%) were self-employed, 50 (34%) were retired and 10 (7%) were unemployed.

### 4.4 Dietary pattern of the respondents

Details regarding the food habit of the respondents, frequency of consumption of a food item per week as well as the quantity of food consumed and the quality and quantity of oil used by the family were considered to assess the dietary pattern of the respondents.

Table 14 Distribution of respondents according to their food habit

| Food habit | Numbers | Percentage |
|---|---|---|
| Vegetarians | 14 | 9.3 |
| Complete non-vegetarians (egg+fish+meat) | 76 | 50.7 |
| Ovo-vegetarians | 3 | 2.0 |
| Respondents consuming fish | 17 | 11.3 |
| Respondents consuming egg + fish | 10 | 6.7 |
| Respondents consuming egg + meat | 1 | 0.7 |
| Respondents consuming fish + meat | 29 | 19.3 |

The distribution of respondents according to their food habit is illustrated in Table 14 and Fig.4.As shown in the table, 14 (9.3%) were vegetarians, 76 (51%) were non-vegetarians, 3 (2%) ovo-vegetarians, 17 respondents (11.3%) consumed only fish. 10 respondents (6.7%) were in the habit of consuming egg and fish and avoided meat, while 29 (19.3%0 excluded egg and consumed fish and meat. There was only one respondent who consumed egg and meat and excluded fish from his diet.

Frequency of using different food items may indicate the nutritional adequacy of a meal and consequently that of the daily diet. Hence the frequency and quantity of food consumed by the respondents were taken into consideration. The details are presented in Table 15.

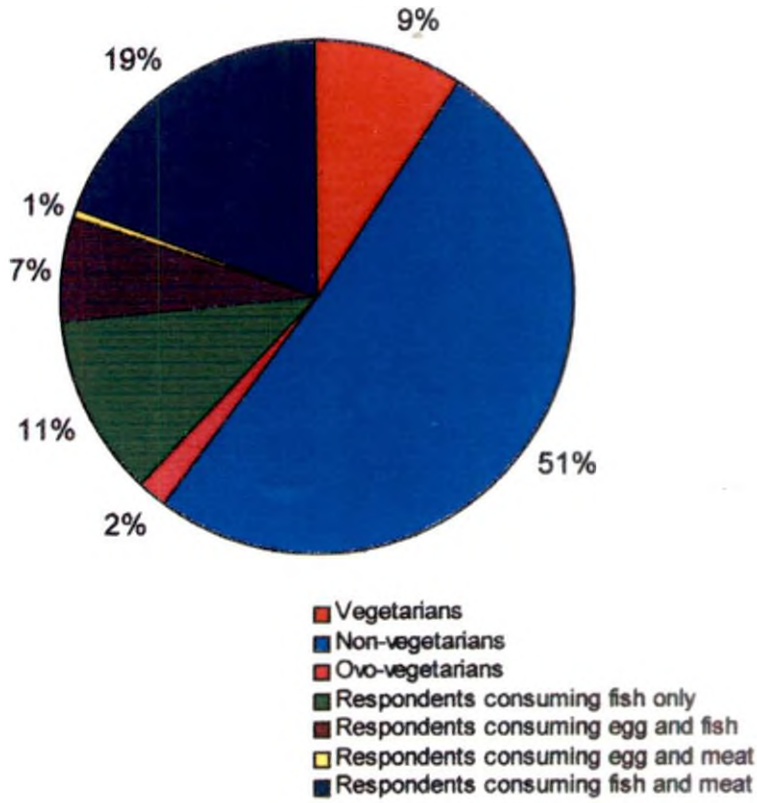


**Fig. 4. Food habit of the respondents**

**Food consumption pattern of the respondents**

The food consumption pattern of the respondents was assessed on the basis of their food habit. The average calorific value, TFA, SFA and cholesterol content of the respondent's diet were computed. It was observed that complete non-vegetarians consumed the maximum amount of calories, TFA and cholesterol where as strict vegetarians had the least calorific value, TFA, SFA and cholesterol intake per day on an average. Regarding SFA intake, respondents consuming egg and fish stood at the top followed by complete non-vegetarians. The details are presented in Table 15.

Table 15 Average calorie, total fatty acid (TFA), saturated fatty acid (SFA) and cholesterol intake per day by the respondents

| Sl.No. | Category | No. of patients | (%) | Average Calorie intake/day (Kcals) | Average TFA intake/day (mg) | Average SFA intake/day (mg) | Average cholesterol intake/day (mg) |
|---|---|---|---|---|---|---|---|
| 1. | Vegetarians | 14 | 9.3 | 2612 | 62.3 | 14.13 | 41 |
| 2. | Complete non-vegetarians | 76 | 51.0 | 4005 | 105.0 | 27.47 | 320 |
| 3. | Ovo-vegetarians | 3 | 2.0 | 3717 | 86.3 | 20.51 | 148 |
| 4. | Respondents consuming fish only | 17 | 11.0 | 3066 | 80.0 | 19.24 | 195 |
| 5. | Respondents consuming egg and fish | 10 | 6.7 | 2959 | 90.3 | 28.13 | 204 |
| * 6. | Respondents consuming egg and meat | 1 | 0.7 | 2338 | 65.0 | 8.79 | 108 |
| 7. | Respondents consuming fish and meat | 29 | 19.3 | 3401 | 91.0 | 15.33 | 222 |

* Excluding the valuessince only one respondent belonged to group 6

Table 16 Average frequency and quantity of foods consumed by the respondents per week

| Food items | Vegetarians | Complete non-vegetarians | Ovo-vegetarians | Respondents taking fish | Respondents taking egg and fish | Respondents taking fish and meat |
|---|---|---|---|---|---|---|
| Rice * | 13 (4.624) | 16.8 (4.97) | 16.33 (4.04) | 14.41 (5.23) | 7.3 (4.83) | 17.07 (4.76) |
| ** | 1170.2 (862.5) | 1693.09 (729.45) | 1400 (700) | 1204.41 (691.42) | 1380 (88.57) | 1544.83 (704.15) |
| Wheat | 7.86 (4.7) | 3.97 (4.7) | 2.33 (4.04) | 6.47 (5.25) | 3.3 (4.7) | 3.31 (4.7) |
| | 514.29 (277.47) | 274.64 (374.27) | 233.33 (404.15) | 495.59 (521.8) | 207.5 (329.57) | 245.69 (357.7) |
| Pulses | 5.3 (3.73) | 8.73 (5.16) | 5.67 (3.21) | 6.29 (4.95) | 4.6 (4.03) | 5.67 (4.52) |
| | 542.86 (393.63) | 850.46 (770.57) | 566.67 (321.46) | 564.71 (496.16) | 324.1 (391.23) | 498.79 (493.08) |
| Leafy | 6.14 (5.76) | 5.21 (4.69) | 6 (2.65) | 4.38 (3.5) | 3.7 (2.6) | 4.53 (3.91) |
| vegetables | 759.29 (949.72) | 569.1 (683.1) | 600 (264.58) | 390.50 (343.52) | 317 (277.9) | 441.38 (549.62) |
| Roots and | 4.75 (5.48) | 4.7 (4.5) | 9.3 (5.03) | 2.97 (3.78) | 1.55 (2.03) | 4.34 (4.23) |
| Tubers | 542.86 (782.96) | 553.55 (656.82) | 1553.3 (1101.5) | 352.9 (552.4) | 106 (160.3) | 505.17 (707.15) |
| Other | 15 (5.39) | 14.23 (6.23) | 10.67 (5.77) | 22.59 (30.83) | 13.9 (3.54) | 11.1 (5.47) |
| vegetables | 2428.57(1168.45) | 2234.86(1611.46) | 2133.33(1154.7) | 2129.41(1397.67) | 2232(1151.24) | 1648.28 (1161.47) |
| Fruits | 3.61 (3.76) | 4.36 (4.85) | 5 (3.46) | 2.82 (3.66) | 3.9 (3.45) | 3.1 (2.83) |
| | 378.57 (370.4) | 470.39 (533.99) | 500 (346.4) | 282.35 (366.12) | 340 (487.51) | 268.97 (255.45) |
| Milk | 19.71 (25.9) | 17.68 (15.24) | 18.67 (14.57) | 14.41 (8.74) | 14.7 (6.96) | 19.48 (10.01) |
| | 1596.43(1546.52) | 2034.54(1706.9) | 2566.67(1069.27) | 1976.47(1976.47) | 1225(1134.53) | 1731.03 (1071.41) |

Table 16 continued

| Food items | Vegetarians | Complete non-vegetarians | Ovo-vegetarians | Respondents taking fish | Respondents taking egg and fish | Respondents taking fish and meat |
|---|---|---|---|---|---|---|
| Milk products | 1.25 (2.47)<br>117.86 (248.54) | 4.02 (3.75)<br>513.82 (650.98) | 4.67 (4.04)<br>350 (350) | 1.76 (2.77)<br>173.53 (268.16) | 2.15 (2.93)<br>215 (286.8) | 2.41 (3.43)<br>237.93 (423.14) |
| Meat | - | 2.16 (3.06)<br>283.29 (426.48) | - | - | - | 1.52 (2.28)<br>137.93 (49.38) |
| Egg | - | 2.41 (2.62)<br>75.26 (76.92) | 3.67 (2.08)<br>113.3 (61.1) | - | 1.4 (1.98)<br>33 (9.49) | - |
| Fish | - | 10.91 (4.72)<br>1483.95(1089.05) | - | 9.35 (4.86)<br>1200 (745.82) | 10.9 (4.09)<br>1230 (365.3) | 10.74 (5.12)<br>1341.38 (1109.3) |
| Coconut | 13.5 (6.98)<br>435 (392.57) | 16.2 (5.72)<br>508.55 (287.71) | 16.33(4.04)<br>560 (121.24) | 17.06 (5.02)<br>445 (186.12) | 16.13 (3.38)<br>546 (265.63) | 13.86 (5.51)<br>455.34 (405.35) |
| Oil | 10.54 (4.55)<br>112.5 (61.67) | 14.84 (5.42)<br>218.75 (167.69) | 14 (0)<br>163.33 (40.41) | 13.06 (4.41)<br>153.24 (97.9) | 14 (4.67)<br>224 (204.22) | 13.03 (4.48)<br>220.86 (202.82) |
| Sugar | 5.5 (8.32)<br>47.14 (78.12) | 19.43 (17.47)<br>112.64 (121.41) | 16.33 (4.04)<br>70 (35) | 8.24 (8.66)<br>44.47 (49.43) | 10.18 (9.05)<br>63 (61.29) | 11.59 (9.59)<br>87.14 (55.6) |
| Pickle | 2.79 (4.69)<br>15 (23.37) | 4.16 (5.24)<br>53.82 (122.87) | 7 (7)<br>35 (35) | 1.06 (2.11)<br>34.41 (94.54) | 3.5 (4.38)<br>23.5 (29.54) | 3.69 (5.95)<br>57.41 (131.19) |

Table 15 Continued

| Food items | Vegetarians | Complete non-vegetarians | Ovo-vegetarians | Respondents taking fish | Respondents taking egg and fish | Respondents taking fish and meat |
|---|---|---|---|---|---|---|
| Confectionary | 0.5 (1.87)<br>14.29 (53.45) | 0.62 (1.91)<br>28.88 (102.45) | - | - | 0.1 (0.32)<br>5 (15.81) | 0.29 (1.49)<br>5.17 (20.46) |
| Beverages | 22 (24.84)<br>4400 (4968.21) | 23.67 (14.55)<br>4576.05 (2959.8) | 21 (12.12)<br>4200 (2424.87) | 16.88 (4.33)<br>3376.47 (865.69) | 16.1 (7.42)<br>1618.05(3220) | 20.76 (9.44)<br>2170.72 (2322.16) |

Figures in parenthesis indicates standard deviation
* - indicates frequency per week
** - indicates quantity per week

As it can be seen from Table 16, the food items like rice, vegetables, milk, coconut, oil and beverages like tea/coffee were more frequently used by all the respondents. Sugar was included only by non-diabetic patients. Milk and sugar included were the ingredients of coffee/tea.

On the basis of food habit, it was observed that complete non-vegetarians (respondents who consumed fish, egg and meat) consumed maximum quantity of rice (1693.09) compared to strict vegetarians who had the least frequency (862.5). The wheat intake was maximum among vegetarians compared to other categories.

Most of the families included different types of pulses like red gram, black gram, green gram, bengal gram or green peas at least once in a week. The average consumption frequency of pulses ranged from five to nine. Non-vegetarians were found to consume maximum quantity of pulses compared to others.

The data revealed that most of the famlies included leafy vegetables, roots and tubers and fruits once a week only. Among leafy vegetables, amaranthus was the most widely used, followed by cabbage and drumstick leaves. Very few (7%) respondents used chekkurmanis also. Maximum frequency and quantity of leafy vegetables were found consumed by strict vegetarians and ovo-vegetarians. Similarly, maximum quantity of roots and tubers were consumed by non-vegetarians, where as the least was observed among respondents who took egg and fish in their diets. Potato, carrot, beetroot and yam were the roots and tubers most commonly used. About 22 per cent of the respondents used tapioca twice a week.

The frequency of consumption of other vegetables was maximum among those taking fish (22.59/week) compared to strict vegetarians; but the quantity of vegetables consumed was highest among vegetarians compared to other categories.

Intake of fruits were restricted to once per week by majority of the families due to their economic incapability. About 3 per cent of the families used fruits on a daily basis. It was noted that plantain was the most commonly consumed fruit. On a weekly basis, ovo-vegetarians consumed the maximum quantity of fruits.

Frequency of using milk ranged from two to three times per day. Vegetarians used milk very frequently in a day, but quantity-wise ovo-vegetarisns stood at the top. Most of the families consumed milk products like curd and buttermilk, but none were in the habit of using cheese. Ghee and butter were found to be used occassionally.

Fleshy foods like chicken, mutton and beef were not included as ingredients in the daily diet, being expensive and due to the advise of the physician. On a weekly basis, the average frequency of consuming meat was found to be two among non-vegetarians. Ovo-vegetarians consumed the maximum amount of egg. Majority of the respondents (88%) included fish daily in their diet.

Coconut was found to be included daily in the diets of all families, frequency of use per week ranging from 13 to 17 meals. Ovo-vegetarins used the maximum quantity of coconut. Oil was used more frequently by non-vegetarians compared to others. It was observed that respondents who consumed egg and fish used maximum quantity of

oil in their diets. Sugar was used by about 70 per cent of the respondents. Maximum frequency and quantity of consumption was seen among the non-vegetarians. Only a few respondents were in the habit of using confectionary and processed foods, maximum being found among non-vegetarians. Beverages like tea/coffee were used frequently by the respondents.

Table 17 depicts the distribution of respondents according to the quality and quantity of oil used.

Table 17 Distribution of families according to the type and quanity of oil consumed per month

| Sl.No. | Characters | Category | No. (%) |
|---|---|---|---|
| 1. | Oil used for cooking | Coconut oil | 106 (70.7) |
| | | Palm oil | 10 (6.7) |
| | | Coconut oil + Palm oil | 25 (16.7) |
| | | Sunflower oil | 7 (4.6) |
| | | Gingerly oil | - |
| | | Rice bran oil | 2 (1.3) |
| | | Mixed oil | - |
| | | Gingely oil | - |
| 2. | Quantity of oil used per month in the family | Upto 1 kg. | 78 (52) |
| | | 1 - 2 kg. | 55 (36.7) |
| | | 2 - 3 kg | 12 (8.0) |
| | | More than 3 kg. | 5 (3.3) |

Table 17 and Fig. 5 depicts the distribution of families according to the type and quantity of oil consumed. 106 (71%) families used coconut oil, 10 (6.7%) used palm oil, 7 (5%) used sunflower oil, 2 (1.3%) used rice bran oil, while 25 (17%) used both coconut oil and palm oil.

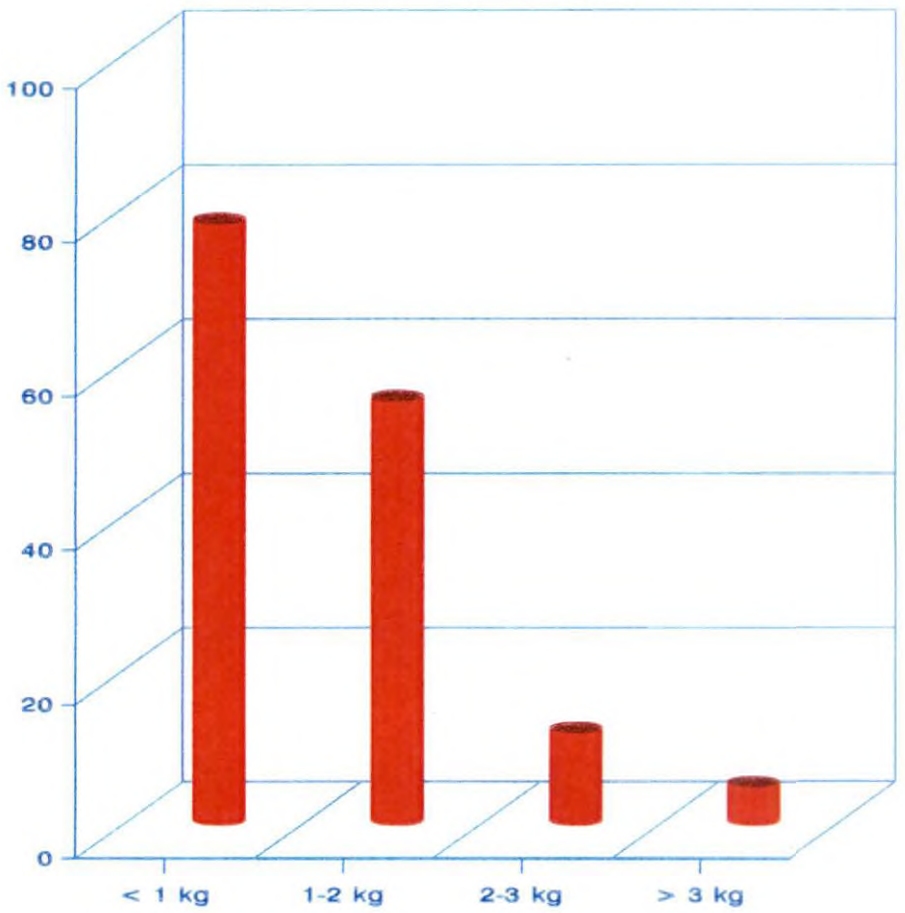


Fig. 5. Distribution of families based on the quantity of oil used per month

Regarding the quanity of oil used per month in the family, 78 (52%) used upto 1 kg, 55 (37%) used 1-2 kg, 12 (8%) used 2-3 kg. While 5 (3%) used more than 3 kg. Gingerly oil could not find a place in their diet and mixed oil was also not consumed by the families

### 4.5 Lifestyle pattern of the respondents

The lifestyle pattern of the respondents such as the frequency type and quantity of alcohol consumed, smoking behaviour, frequency, type and duration of exercise done were recorded.

Table 18 Distribution of respondents based on the frequency of consumption of alcohol and smoking habit

| Frequency of alcohol consumption | Men | Women |
|---|---|---|
| Daily | 12 (8) | - |
| Most often | 3 (2) | - |
| Weekends | 10 (6.7) | - |
| Occassionally | 15 (10) | - |
| Never | 30 (20) | 58 (100) |
| Ex-alcoholics | 22 ( ) | - |
| Total | 92 (100) | 58 (100) |
| **Smoking habit** | **Men** | **Women** |
| Cigarette | 24 | - |
| Beedi | 10 | - |
| Cigarette + beedi | 12 | - |
| Other items | 3 | - |
| Non-smokers | 5 | 58 (100) |
| Ex-smokers | 38 | - |
| Total | 92 (100) | 58 (100) |

In the lifestyle pattern of the respondents, data regarding alcohol consumption, smoking habits and exercising were collected. As indicated in Table 18, 12 (8%) respondents were regular consumers of alcohol, 3 (2%) respondents had the habit of using alcohol often, 10 (6.7%) respondents consumed alcohol during weekends and 15 (10%) respondents used alcohol occassionally. 88 (58.7%) respondents were non-users of alcohol, which included all the 58 women surveyed. The remaining 22 (14.6%) respondents were ex-alcoholics.

Smoking habit of the respondents in relation to the type of cigarette/beedi used was observed. Out of the 150 respondents surveyed, 24 (16%) used cigarette, 10 (6.7%) used beedi, 12 (8%) used both cigarette and beedi, while 3 of them (2%) used other items like snuff and pan. Among the 92 male respondents surveyed, 5 (3.3%) were non-smokers, while 38 (25.3%) were ex-smokers for a period ranging from 1 to 10 years. All the 58 female respondents surveyed were non-smokers.

Table 19 Distribution of respondents based on the type and quantity of alcohol consumed

| Characteristics | Category | No. (%) |
|---|---|---|
| Type of alcohol consumed | Brandy | 13 (32.5) |
| | Toddy | 9 (22.5) |
| | Whisky | 9 (22.5) |
| | Rum | 3 (7.5) |
| | Any brand | 6 (15) |
| | Total | 40 (100) |
| Quantity of alcohol consumed/day | ± 200 ml | 24 (60) |
| | 201-500 ml | 12 (30) |
| | > 500 ml | 4 (10) |
| | Total | 40 (100) |

Out of the 40 respondents who were alcoholics, 13 (32.5%) used brandy, 9 (22.5%) used toddy, 9 (22.5%) used whisky, 3 (7.5%) used rum while 6 (15%) respondents used any brand they liked. 24 respondents (60%) consumed upto 200 ml alcohol, while 12 (30%) respondents used 200 to 500 ml alcohol and 4 (10%) respondents used more than 500 ml of alcohol per day.

Table 20 Distribution of respondents based on their habit of doing exercise

| Characteristics | Category | No. (%) |
|---|---|---|
| Frequency of doing exercise | Regular | 46 (30.6) |
| | Never | 104 (69.4) |
| Type of exercise | Stretching | 16 (35) |
| | Walking | 24 (52) |
| | Breathing | 6 (13) |
| | Total | 46 (100) |
| Duration of doing exercise | < 1 hour | 29 (63) |
| | 1-2 hours | 17 (37) |
| | Total | 46 (100) |

Details regarding the frequency, type and duration of doing exercise were also collected. Among the 150 respondents surveyed, 46 (30.6%) had the habit of doing exercise. Out of these 46 respondents, 16 (35%) did stretching exercises, while 24 (52%) subjects had the habit of walking regularly and 6 (13%) respondents did breathing exercises. 29 (63%) respondents did exercise for one hour, while rest of the 17 (37%) subjects did exercise for 1½ to 2 hours.

### 4.6 Blood lipid profile of the respondents

The TC, TG, HDL and LDL values of all the respondents surveyed were recorded from hospital records.

Table 21 Distribution of respondents according to the blood lipid profile

| Lipid constituents | Normal value (mg/100 ml) | No. (%) |
|---|---|---|
| Total cholesterol (mg/100 ml) | 220 | |
| < 220 | | 15 (10) |
| 220-240 | | 90 (60) |
| > 240 | | 45 (30) |
| Triglyceride (mg/100 ml) | 150 | |
| < 150 | | 25 (17) |
| 150-200 | | 105 (70) |
| > 200 | | 20 (13) |
| HDL cholesterol (mg/100 ml) | 55 | |
| 30-55 | | 135 (90) |
| > 55 | | 15 (10) |
| LDL cholesterol (mg/100 ml) | 150 | |
| < 150 | | 45 (30) |
| 150-200 | | 90 (60) |
| > 200 | | 15 (10) |

The distribution of respondents according to the blood lipid profile is depicted in Table 21.

Results of the initial blood analysis showed that the TC level of the respondents ranged from 158 mg to 323 mg/100 ml, with the mean value of 240 mg/100 ml. Only 15 (10%) respondents had total TC less than the normal value, 90 (60%) had TC between 220-240 mg/100 ml, while 45 (30%) had TC value above 240 mg/100 ml.

Similarly, 105 (70%) respondents had TG value between 151-200, while 25 (17%) had TG value below 150 mg/100 ml and 20 (13%) had above 200 mg/100 ml. The TG values of the respondents ranged from 82 to 225 mg/100 ml with the average value of 161 mg/100 ml.

HDL cholesterol of the respondents ranged from 30 to 60 mg/100 ml., with the mean value of 38 mg/100ml. 135 (90%) respondents fall in the range 30 to 55 mg/100 ml, while the remaining 15 (10%) had HDL value above the normal.

LDL cholesterol value of the respondents ranged from 130 to 220 mg/100 ml., with an average value 165 mg/100 ml. As it is clear from the table, 105 respondents (70%) had LDL above the normal value.

## 4.7 Association of dietary and non-dietary factors with blood lipid profile

Table 22 Association of personal characteristics with blood lipid profile

| Sl.No. | Personal characteristics | TC | TG | HDL | LDL | VLDL |
|---|---|---|---|---|---|---|
| 1. | Age | 0.3062** | -0.0434 | 0.2026* | -0.3059** | 0.0324 |
| 2. | Food habit | 0.2313** | -0.1691* | -0.2990** | 0.4059** | 0.2206* |
| 3. | Duration of exercise | -0.0642 | 0.1336 | -0.0235 | -0.1740* | 0.0341 |
| 4. | Quantity of alcohol used /day | 0.1678* | 0.1396 | 0.0783 | -0.1465 | -0.0393 |
| 5. | No.of cigarettes used/day | 0.3089** | 0.0168 | 0.1552 | 0.3091** | 0.2041* |

* Significant at 5% level

** Significant at 1% level

As depicted in Table 22, there was highly significant correlation for age with TC (0.3062) and LDL cholesterol (-0.3059). A higly significant positive correlation was observed for food habit against TC (0.2313), LDL (0.4059) and VLDL values (0.2206). A significant negative correlation was seen between food habit and HDL (-0.2990). Correlation between TG values and food habit (-0.1691) was significant at 5% level.

The present study did not reveal any significant correlation between blood lipid profile and duration of exercise except with LDL values (-0.174). A correlation significant at 5 per cent level was observed between quantity of alcohol consumed and TC values. Significant positive correlation was noted for number of cigarettes used per day against TC (0.3089) and LDL values (0.3091).

Table 23 Correlation of energy index (Calorific value) with blood lipid profile

| Blood lipid constituents | Energy index |
|---|---|
| Total cholesterol | 0.3248** |
| Triglyceride | 0.1124 |
| HDL | -0.0428 |
| LDL | 0.3792** |
| VLDL | 0.1615* |

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

As depicted in Table 23, a highly significant correlation was observed for TC (0.3248) and LDL (0.3792) values with the energy index. Correlation between the energy index and VLDL cholesterol (0.1615) was significant at 5 per cent level.

Table 24 Correlation of different food items with blood lipid profile

| Food items | TC | TG | HDL | LDL | VLDL |
|---|---|---|---|---|---|
| Rice | 0.2424** | -0.0592 | 0.0879 | 0.3116** | 0.0301 |
| Wheat | -0.2057* | 0.0137 | 0.1279 | -0.2663** | -0.1318 |
| Pulses | 0.1007 | 0.1077 | -0.0355 | 0.1296 | 0.0908 |
| Leafy vegetables | -0.3104** | -0.1534 | 0.2344** | -0.2187** | 0.0496 |
| Roots and tubers | 0.0427 | 0.0853 | -0.0465 | 0.1228 | -0.1278 |
| Other vegetables | 0.0663 | -0.3219** | -0.2189** | 0.1324 | -0.0367 |
| Fruits | 0.0121 | 0.1814* | 0.0238 | -0.1105 | 0.3248** |
| Milk | 0.1118 | -0.1257 | 0.3044** | 0.0926 | -0.1081 |
| Milk products | 0.1386 | 0.0640 | 0.1092 | 0.1201 | 0.0361 |
| Meat | 0.1532 | 0.3621** | -0.2740** | 0.2301 | 0.2449** |
| Egg | 0.0206 | 0.3340** | 0.0229 | 0.0013 | -0.2994** |
| Fish | -0.4475** | -0.0951 | +0.2834** | -0.5698** | -0.0258 |
| Coconut | 0.2045* | -0.0951 | -0.0011 | 0.2384** | -0.1755* |
| Oil | 0.2357* | 0.2560** | 0.0603 | 0.1551 | 0.1656* |
| Sugar | 0.1233 | 0.3253** | -0.1367 | 0.1496 | 0.3512** |
| Processed foods | -0.2030* | 0.0776 | 0.1863 | -0.2641** | -0.0227 |
| Confectionary | -0.1974* | 0.0872 | -0.1775* | -0.2097** | -0.0064 |
| Beverages | 0.0623 | 0.2367** | -0.0769 | 0.0116 | 0.4593** |

Results in Table 24 indicate that there is highly significant correlation for consumption of rice against TC (0.2434) and LDL cholesterol (0.3116). Significant negative correlations were observed for consumption of wheat against TC (-0.2057) at 5 per cent level and LDL cholesterol (-0.2663) at 1 per cent level; while for leafy vegetables, negative association at 1 per cent level was observed for TC (-0.3104) and LDL (-0.2187). A positive correlation was noted between leafy vegetables and HDL

values (0.2344), significant at 1 per cent level. Similarly, there was highly significant negative correlation between consumption of other vegetables and TG (-0.3219). Highly significant correlations were also observed for consumption of meat (0.3621) and egg (0.3360) against TG. Another significant result obtained was the highly significant negative correlation for consumption of fish against TC (-0.4475) and LDL cholesterol (-0.5698). Consumption of sugar was significantly correlated with TG (0.3253) and VLDL cholesterol (0.3512). It was also observed that there was highly significant correlation between the consumption of beverages and level of VLDL cholesterol in blood

**4.8 Conduct of diet counselling**

150 respondents attending the cardiology O.P. of Medical College Hospital - Thiruvananthapuram, Al-arif Hospital - Ambalathara and P.R.S. Hospital - Killippalam were selected for the study. After discussions with the medical practitioners, a general counselling was conducted for the respondents.

The awareness about dietary modifications needed for the respondents were ascertained by conducting a pre and post-test using a suitably structured schedule.

Table 25 Distribution of respondents based on their pre-test and post-test scores during general counselling

| Awareness category | Distribution of respondents | |
|---|---|---|
| | Pre-test No. % | Post-test No. % |
| Low (<35.33) | 90 (60) | - - |
| Medium (35.33-45.6) | 40 (27) | 15 (10) |
| High (>45.6) | 20 (13) | 135 (90) |
| Total | 150 (100) | 150 (100) |

Before the general counselling, it was observed that majority (87%) of the respondents had low to medium awareness about the relationship of diet and heart discase. After the general counselling, it was noted that 90% of the respondents had increased awareness about diet and cardiac disease (Table 25).

**Adoption rate of the respondents**

The adoption rate of the respondents was ascertained using standard techniques and those who were willing to adopt the dietary modifications were selected for intensive diet counselling.

Table 26 Distribution of respondents based on their rate of adoption during general counselling

| Rate of adoption | Distribution of respondents | |
|---|---|---|
| | Number | Percentage |
| > 70% | 105 | 70 |
| 50 - 70% | 30 | 20 |
| < 50% | 15 | 10 |
| Total | 150 | 100 |

As shown in Table 26, 105 (70%) respondents who were given general counselling were willing to adopt the dietary modifcations readily. From the 70 per cent of respondents with high adoption rate, 30 respondents were selected for intensive diet counselling.

**Intensive diet counselling**

Intensive diet counselling was conducted for the selected 30 respondents along with their spouses. Diet charts and booklets were distributed to them and the method of preparation of different menus were explained. The respondents were advised to follow the modified diet for a period of three months. A log book was maintained by the respondents to note any deviation made.

## 4.9 Evaluation of impact of the reversal diet

The impact of the reversal diet was assessed based on

i) Rate of adoption of the diet

ii) Gain in knowledge and

iii) Change in blood lipid profile

### 4.9.1 Rate of adoption of the diet

The rate of adoption of reversal diet was assessed by administering a checklist of 10 statements pertaining to the principles of reversal diet, three months after the intensive diet counselling.

Table 27 Distribution of respondents based on the rate of adoption during intensive diet counselling

| Rate of adoption | No. | (%) |
|---|---|---|
| > 70% | 22 | 73.3 |
| 50 - 70% | 7 | 23.3 |
| < 50% | 1 | 3.4 |
| Total | 30 | 100 |

As it is clear from Table 27, majority (73%) of the respondents acquired more than 70 per cent of the knowledge disseminated through counselling, while 7 (23.3) respondents adopted between 50 and 70 per cent and only one respondent scored below 50 per cent.

### 4.9.2 Gain in knowledge

The gain in knowledge of the respondents was assessed with respect to the pre and post-knowledge scores.

Table 28 Distribution of respondents based on their pre-test and post test scores during intensive diet counselling

| Category | Distribution of respondents | | | |
|---|---|---|---|---|
| | Pre-test score | | Post-test score | |
| | No. | % | No. | % |
| Low (< 35.33) | 15 | 50 | - | - |
| Medium (35.33 - 45.6) | 10 | 33 | - | - |
| High (> 45.6) | 5 | 17 | 30 | 100 |
| Total | 30 | 100 | 30 | 100 |

The results of post-knowledge test showed that all the 30 subjects scored more than 45.6 out of 50. Thus 100 per cent of the respondents who had undergone intensive diet counselling programme had scored high marks (>45.6), which reveals their knowledge gain. The distribution of respondents based on their pre-test and post-test scores is depicted in Table 28 and the gain in knowledge is illustrated in Fig. 6.

### 4.9.3 Change in blood lipid profile

The blood samples of 30 respondents selected for intensive diet counselling were collected and estimated for lipid profile both before and after the counselling programme.

Table 29 presents the initial and final blood lipid profile of the respondents selected for intensive diet counselling.

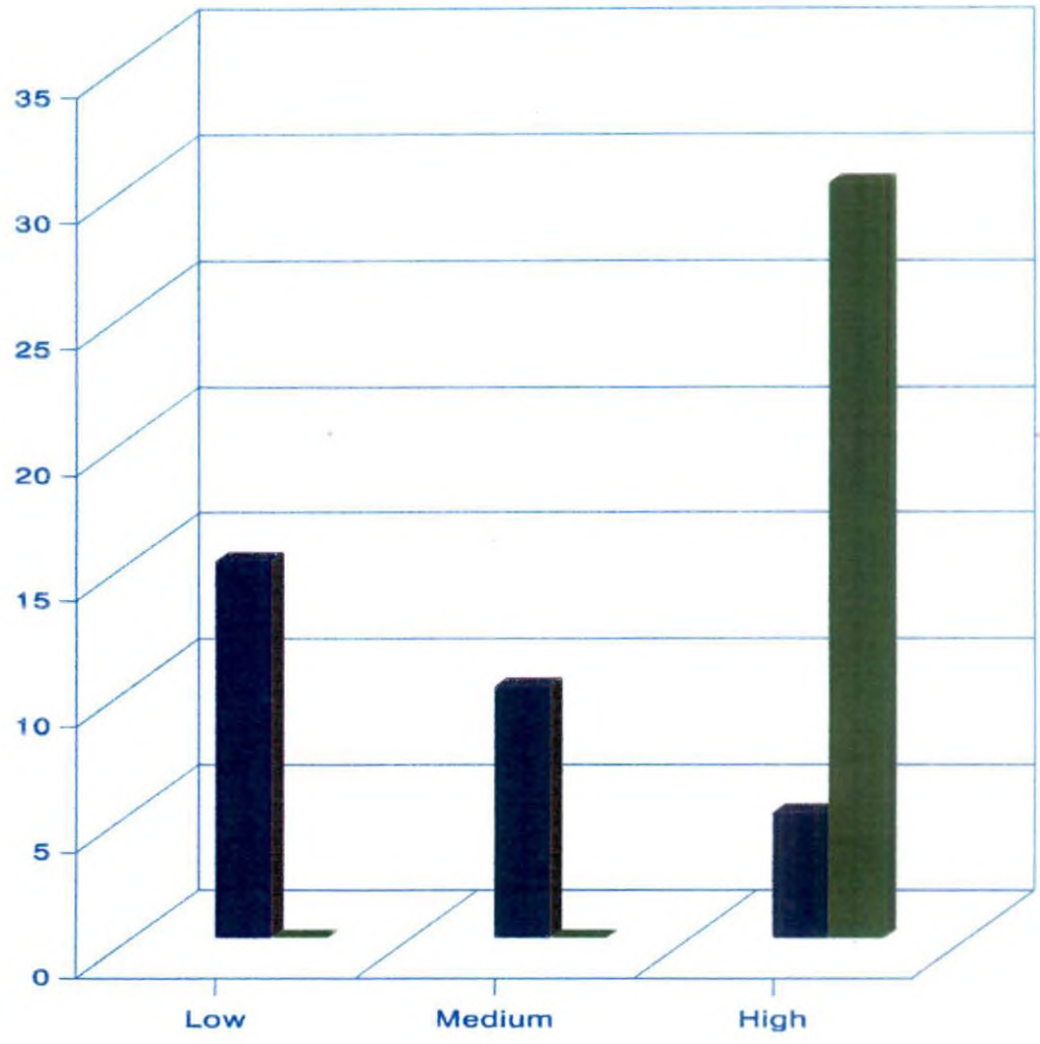


**Fig. 6. Gain in knowledge of the respondents after intensive diet counselling**

Table 29 Initial and final blood lipid profile of the respondents selected for intensive diet counselling

| Sl. No. | Total colesterol | | Triglyceride | | HDL cholesterol | | LDL cholesterol | | VLDL cholesterol | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| 1. | 237 | 230 | 188 | 185 | 40 | 41 | 159 | 158 | 38 | 38 |
| 2. | 215 | 215 | 170 | 170 | 42 | 42 | 139 | 135 | 32 | 30 |
| 3. | 250 | 246 | 150 | 143 | 42 | 45 | 190 | 190 | 35 | 35 |
| 4. | 172 | 170 | 99 | 100 | 30 | 32 | 116 | 115 | 19 | 19 |
| 5. | 245 | 240 | 101 | 100 | 37 | 38 | 188 | 150 | 21 | 20 |
| 6. | 206 | 205 | 138 | 186 | 37 | 40 | 151 | 145 | 25 | 24 |
| 7. | 214 | 214 | 82 | 80 | 27 | 30 | 158 | 155 | 16 | 15 |
| 8. | 224 | 223 | 200 | 198 | 40 | 40 | 127 | 125 | 40 | 38 |
| 9. | 204 | 200 | 155 | 150 | 60 | 59 | 145 | 130 | 31 | 30 |
| 10. | 215 | 212 | 112 | 110 | 28 | 30 | 158 | 151 | 22 | 20 |
| 11. | 323 | 300 | 200 | 195 | 35 | 36 | 248 | 240 | 40 | 38 |
| 12. | 224 | 224 | 96 | 95 | 35 | 35 | 167 | 150 | 19 | 15 |
| 13. | 235 | 234 | 155 | 150 | 38 | 40 | 173 | 163 | 31 | 30 |
| 14. | 186 | 182 | 250 | 239 | 31 | 33 | 110 | 110 | 50 | 45 |
| 15. | 240 | 239 | 252 | 252 | 26 | 28 | 157 | 150 | 50 | 42 |
| 16. | 213 | 212 | 123 | 120 | 33 | 35 | 162 | 160 | 25 | 25 |
| 17. | 180 | 180 | 100 | 101 | 26 | 28 | 157 | 150 | 30 | 28 |
| 18. | 158 | 151 | 110 | 103 | 39 | 40 | 145 | 142 | 57 | 55 |
| 19. | 249 | 249 | 286 | 285 | 31 | 38 | 110 | 103 | 18 | 15 |

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Table 29 continued

| Sl. No. | Total colesterol | | Triglyceride | | HDL cholesterol | | LDL cholesterol | | VLDL cholesterol | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| 20. | 262 | 260 | 90 | 90 | 29 | 31 | 157 | 152 | 15 | 13 |
| 21. | 118 | 115 | 74 | 70 | 48 | 50 | 162 | 161 | 25 | 25 |
| 22. | 200 | 190 | 127 | 125 | 31 | 32 | 125 | 120 | 22 | 22 |
| 23. | 162 | 157 | 108 | 108 | 30 | 30 | 191 | 190 | 19 | 18 |
| 24. | 155 | 151 | 95 | 92 | 31 | 33 | 161 | 160 | 30 | 25 |
| 25. | 256 | 241 | 97 | 95 | 31 | 36 | 215 | 200 | 45 | 42 |
| 26. | 232 | 230 | 162 | 160 | 28 | 32 | 155 | 147 | 36 | 33 |
| 27. | 191 | 190 | 63 | 63 | 30 | 32 | 144 | 142 | 41 | 40 |
| 28. | 272 | 252 | 110 | 108 | 32 | 38 | 110 | 105 | 34 | 32 |
| 29. | 214 | 202 | 198 | 190 | 27 | 29 | 105 | 105 | 38 | 35 |
| 30. | 311 | 275 | 126 | 120 | 30 | 30 | 205 | 206 | 28 | 28 |

As depicted in Table 29, the initial TC values ranged between 118 and 323 with a mean value of 219 mg/100 ml, while the final values ranged between 115 and 300 with a mean value 213 mg/100 ml.

The initial TG value of the patients ranged between 63 and 286, with a mean value 141 mg/100 ml, while the final values ranged between 63 and 185 with a mean value 136 mg/100 ml.

Regarding HDL cholesterol, the mean value was 34 mg/100ml initially and 36 mg/100 ml finally.

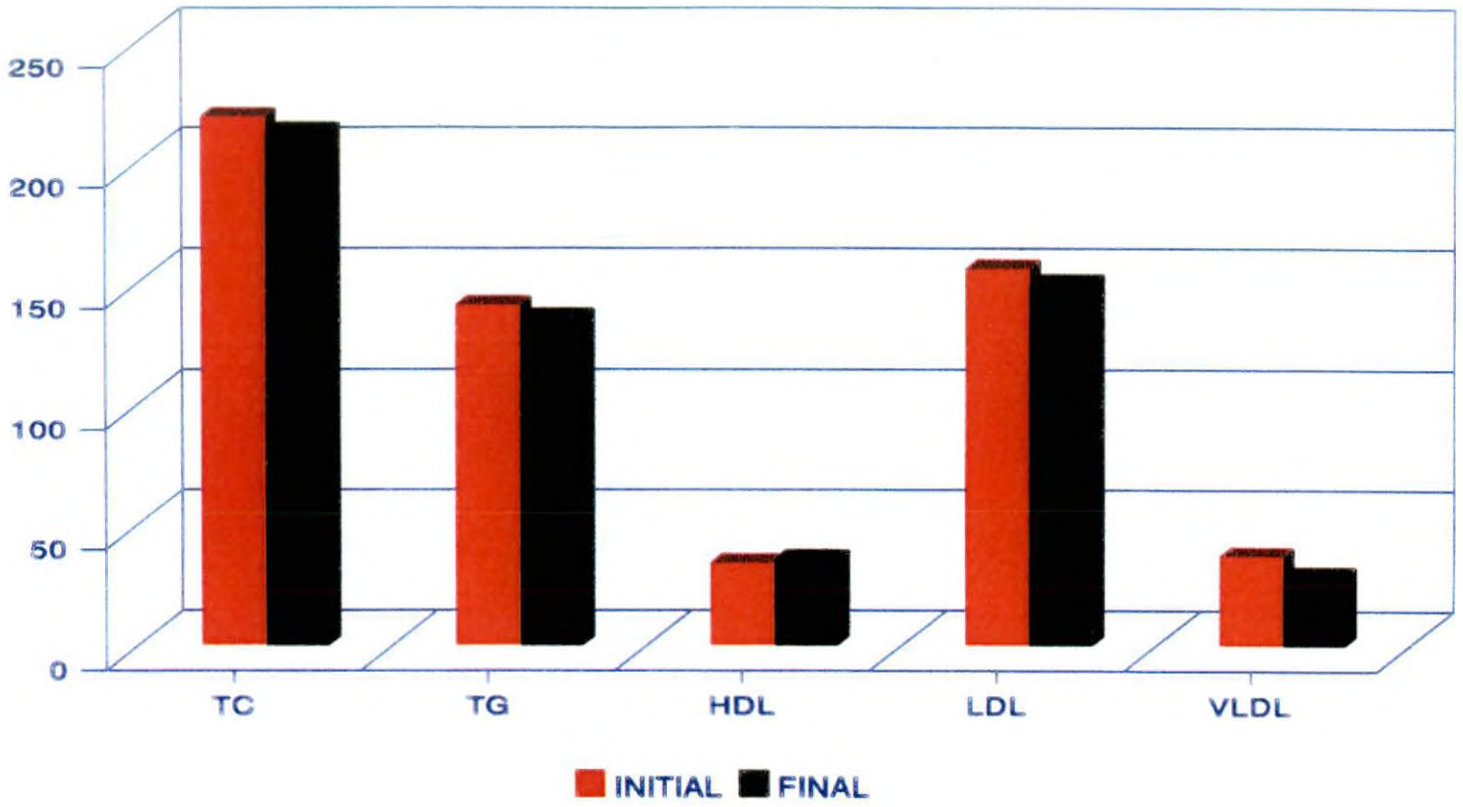


**Fig. 7. Change in blood lipid profile of the respondents after intensive diet counselling**

The initial LDL cholesterol values of the respondents ranged between 105 and 248, with the mean value 156 mg/100 ml, while the final values ranged between 105 and 240 with a mean value 150 mg/100 ml.

With regard to VLDL cholesterol the mean value was 37 mg/100 ml initially, while the final value was 29 mg/100 ml.

Inorder to find out whether there is significant difference between the initial and final blood lipid values, they were analysed through `paired t-test'.

Table 30 Test for significant difference in the blood lipid values before and after intensive diet counselling (Paired t-test)

| Lipid constituents | Calculated t value | Tabulated t value for 28 degrees of freedom |
|---|---|---|
| Total cholesterol | 3.67 | |
| Triglyceride | 5.90 | |
| HDL cholesterol | 3.65 | 2.048 |
| LDL cholesterol | 6.58 | |
| VLDL cholesterol | 3.45 | |

(Tabulated t value at 5% level of significance)

Since the calculated t values are greater than the tabulated t value, there is significant difference in the blood lipid values of the respondents before and after the counselling programme.

# DISCUSSION

# 5. DISCUSSION

Cardiac disease is the result of complex interrelated processes that involve several dietary factors influencing numerous physiological and metabolic processes. Therefore dietary goals for prevention and treatment should be to achieve proper balancing of nutrients, which ultimately maintains appropriate body weight and regulate the blood lipids (Ghafoorunisa and Krishnaswamy, 1995).

The present study entitled **"Standardisation of reversal diets for cardiac patients"** was undertaken with a view to study the impact of diet counselling on the blood lipid profile of cardiac patients. The results of the study are discussed under the following heads:

5.1 Standardisation of reversal diets.

5.2 Socio-economic profile of the respondents.

5.3 Dietary pattern of the respondents.

5.4 Lifestyle pattern of the respondents.

5.5 Blood lipid profile of the respondents.

5.6 Association of dietary and non-dietary factors with blood lipid profile.

5.7 Conduct of diet counselling.

5.8 Evaluation of the impact of reversal diet.

## 5.1 Standardisation of reversal diet

Dietary guidelines are important to the common man as well as to respondents to enable them for ensuring optimal health and freedom from diseases. According to Gopalan (1995), there is increasing public awareness of the importance of diet for the maintenance and promotion of health. Inorder that this awareness is not misused to spread misinformation and for commercial exploitation, it is important that authentic information based on scientific details is made available to the public.

Observing the principles and guidelines of the reversal diet, breakfast recipes, lunch and dinner along with side dishes, beverages and snacks were standardised in the laboratory. Proper care was taken in observing the different steps in standardising such recipes.

Since breakfast should contribute at least 1/3 $^{rd}$ of the daily requirement of the individual, care was taken to include a variety of foodstuffs with good nutrient content. The major ingredients included for breakfast were rice flour, wheat flour, oats, barley and unfamiliar foods like kuskus. Skimmed milk powder, fruits and vegetables were also used to standardise breakfast items. Cereals like rice and wheat were used frequently since carbohydrate foods may not increase the lipid profile status. Similar observations have been made by Akanji et al. (1992).

The total amount of energy, protein, fats and fibre content of the breakfast recipes were computed to assess whether the recipes met the 1/3rd requirement. The mean energy content of 1000, 1250 and 1500 Kcal. diets were 227.5 Kcal., 250 Kcal. and 277.5 Kcals. respectively. With regard to protein, the mean values were 11.9 g, 13.9 g and 16.1 g for 1000, 1250 and 1500 Kcal. diet. The mean fat content of the breakfast items were 1.7 g, 3 g and 4.4 g, while the mean fibre content were 2.6 g, 3.5g and 5 g for 1000, 1250 and 1500 Kcal. diets.

Unlike breakfast and dinner, lunch was made rich with side dishes like fresh salads, fruits and legume dishes. Since lunch should provide enough quantity of energy and protein for doing the day's work, care was also taken to include rice, the staple food of Keralites, along with a variety of vegetables, different types of legumes with vegetable dressings and very little quantity of fat.

Coming to the nutrient content of the lunch, the mean energy content of the recipes were 280 Kcals., 301 Kcals. and 323 Kcals. for 1000, 1250 and 1500 Kcal. diets. In the case of protein, the mean values were 9.3 g, 12 g and 14 g for 1000, 1250 and 1500 Kcals. respectively. Regarding the fat content, the mean values were 4g, 6g and 6.8 g, while the fibre content were 4g, 6g and 8g for 1000, 1250 and 1500 Kcal.

Dinner was planned to be the lightest meal to avoid digestive problems and reduce strain to the heart. It was also proposed to serve dinner at least two hours before going to bed. Cereals like rice and wheat were again used for dinner along with small quantity of vegetables and fruits. Kanji (gruel), the traditional recipe of Kerala was

frequently prepared both with rice and wheat. When vegetable and legumes were incorporated, they were used in mashed form. The other items included in dinner were soft dosas without oil.

Regarding the nutrient content, the mean energy content of dinner items were 232.5 Kcals., 252.5 Kcals. and 275 Kcals., while the protein contents were 11 g, 13 g and 15.4 g for 1000, 1250 and 1500 Kcals. diets. With regard to the fat content, the mean values were 4 g, 5.5 g and 6.5 g, while the mean fibre content were 4.5 g, 5.3 g and 6.5 g for 1000, 1250 and 1500 Kcal. diets.

The major principles of menu planning are attractiveness and judicious inclusion of variety and colour. In the present study, these were found met in the standardised 30 side dishes, which included legumes, vegetables, fruits, green leafy vegetables, coconut the inseparable food item of Kerala along with spices.

Beverages are foods or food products consumed primarily for thirst-quenching properties and secondary for food value, which contains 20 to 50 per cent citrus juice content and may include sugar or syrup and certain nutrient ingredients (Potter, 1986). Five different types of beverages were standardised in the present study. Weak tea was standardised, purposely avoiding coffee, since coffee has an adverse effect on heart. Green and Jucha (1986) have indicated an association between coffee intake and increased levels of serum cholesterol in men and women. Other beverages standardised were fruit juices and vegetable juices along with tender coconut water

and buttermilk. Too much of sugar was avoided in the preparation of juices to cut down the calories.

Coming to the nutritive value of the beverages, the mean energy content were 71 Kcals., 90 Kcals. and 118 Kcals; while the mean protein content were 2 g, 3 g and 4 g respectively for 1000, 1250 and 1500 kcals. diets. Regarding the fat content of the diet, the mean values were 0.8g, 1.2g and 1.5 g whereas the fibre content were 1 g, 1.5 g and 2 g respectively for 1000, 1250 and 1500 Kcals. diets.

According to the principles of diet planning for cardiac patients, five small meals were planned instead of three major meals. Hence snack items attained a major role in the present diet plan. Accordingly five snack items such as sweet ada, vegetable sandwich, sundal, french toast and rice flakes upma were standardised. Small quantity of fat, jaggery and skimmed milk were used for the preparation of these snacks. The other item used as snack was arrowroot biscuit, which is less expensive with low calorie.

Regarding the nutritive value, the mean energy content of the snacks were 140 Kcals., 178 Kcals. and 220 Kcals; while the mean protein content were 3.5 g, 4.6 g and 5.4 g for 1000, 1250 and 1500 Kcals. diets. With regard to the fat content, the mean values were 3.5 g, 4.3 g and 5.4 g; while the mean fibre content were 4 g, 5.1 g and 6.5 g for 1000, 1250 and 1500 Kcal. diets.

## 5.2 Socio-economic profile of the respondents

Social factors like religion, occupation, economic status, education, beliefs and culture had important bearing on health (Ghosh, 1989). According to Sirshi (1985), details pertaining to the type of family, family size, monthly income and caste are to be ascertained to assess the socioeconomic status. Socio economic factors have a definite bearing on the dietary habits of the people and thereby on their dietary intake and nutritional status (Cicil, 2000).

### Age

In the present study, 53 per cent of male respondents surveyed belonged to the age group between 30 and 60 years, followed by 40 per cent above the age of 60 years, and only seven per cent were below 30 years of age. According to AHA (1999), about four out of five people who died of CHD were of age 60 or older. Data from the office of population consensus and surveys also showed that CHD was the dominant cause of death in men after the age of 40 (Third Report of a Joint Cardiology Committee, 1985). Regarding females, about 55 per cent of the respondents belonged to the age group between 30 and 60 years followed by 32 per cent above the age of 60 and 13 per cent below 30 years of age..

### Sex

The fact that men are more prone to CVD than women was observed in the present study also. Out of the 150 respondents surveyed, 61 per cent were men and

39 per cent were women. This result is in line with the results of many authors. Godsland et al (1987) also found that the incidence of CHD was higher in men than in women due to difference in plasma lipoprotein risk factors and hormones between the sexes.

**Religion**

The study revealed that Hindus predominated the sample population 60 per cent of the respondents were Hindus, 23 per cent were Muslims followed by Christians (17%). The Kerala Statistical Institute (1992) reveals that majority of the population of Thiruvananthapuram district follow Hindu religion. Similar trend was reflected in the respondent population also

**Type of family**

81 per cent of the respondents belonged to nuclear families, while 19 per cent belonged to joint families. Predominance of nuclear type families among those residing in Thiruvananthapuram has been reported by Lovely (1996). The same trend is reflected in the present study also.

**Family size**

Family size indirectly affects the nutritional and health status of an individual. The present study revealed that 57 per cent of the families had 1 to 4 members. Park and Park (1991) reports that the average family size in India is four. The remaining

43 per cent of families had 5-8 members. Cicil (2000) supports that small families have a direct impact on the nutritional status of families.

**Monthly income**

Contradictory to the belief that cardiac disease is common among high income group, it was found that 53 per cent of the respondents belonged to a monthly income group of Rs.3000 or less, while 38 per cent belonged to a monthly income group between Rs.3000 and Rs.8000 and 9 per cent belonged to the monthly income group above Rs.8000. Arora (1991) suggested that household income should be taken into consideration because it is the family income which determines the socio economic strata to which a person belongs.

**Employment status**

The occupational status directly or indirectly influences the health condition of an individual. In the present study, 34 per cent of the respondents were retired, 25 per cent worked in private concerns, 17 per cent were Government employees, 17 per cent were self employed and 7 per cent were unemployed. Dandekar and Rath (1971) had reported that due to unemployment and underemployment, atleast 30 per cent of the population in India were living below the poverty line, which had directly affected their health status.

**Expenditure pattern on food and health care**

A wide variation was observed in the expenditure pattern of the respondents with respect to food and health cave. A general trend observed in the survey was that as the monthly income increased, percentage of income spent on food decreased and vice versa.

A highly significant negative correlation (-0.4003) was seen between monthly income and percentage of income spent on food. Similarly, a significant correlation was obtained between number of family members and percentage of income spent on food (0.3013). Significant correlation (0.2226) was also observed between percentage of income spent on food and duration of heart disease.

**5.3 Dietary pattern of the respondents**

Diet has a far reaching influence on health and nutritional status. Much research over the past 40 years has linked dietary intake of saturated fat and cholesterol to the development of CHD (Lisa , 1996).

**Food habit**

According to Devadas and Easwaran (1986) food habit of the people depends on the availability of food, which is influenced by socioeconomic, environmental, religious and related factors. In the present study, 51 per cent were complete non-

vegetarians who included egg, fish and meat in their diet. Only 9 per cent were strict vegetarians who excluded fish, meat and egg from their diet. This is in accordance with the findings of Stephanie (1984) who opined that in South India, only about 28 per cent of the total population were completely vegetarians.

All the non-vegetarians, except one, included fish in their diet daily. This may be due to the proximity of city to coastal areas or due to increased awareness about the advantages of fish in the diet.

Out of the 150 respondents surveyed, only 2 of them sticked on to a special diet under the prescription of a physician. All the other respondents followed only the traditional diet. The special diet followed was a low fat, low salt, moderate calorie diet. The major reason behind less acceptability of a special diet may be due to the lack of taste, appearance, flavour or unwillingness to change from the traditional cuisine.

About 95 per cent of the respondents were in the habit of taking three main meals (breakfast, lunch and dinner) a day, while 4 per cent took only two meals a day. This may be due to the poor economic status or over consciousness about calories, which may be a burden to the heart. (Chrombie et al., 1989).

**Food consumption pattern of the respondents**

(Sujatha, 199

Food consumption pattern of an individual reveals his/her nutritional status. In the present, it was observed that all the respondents had average calorie, TFA, SFA

and cholesterol intake per day greater than the Recommended Daily Allowance (RDA). Strict vegetarians had the minimum intake of calories, TFA, SFA and cholesterol. Similar observations have been made by Thorogood et al. (1987) who reported a lower cholesterol concentration in vegetarians than in those who eat meat.

The maximum intake of calories, TFA and cholesterol was observed among complete non-vegetarians, which might be probably due to the inclusion of egg and meat in their diets. Barasi (1997) has also opined that the non-vegetarians were at borderline risk level for CVD with elevated serum TC and LDL cholesterol levels. According to Etherton et al. (1988), SFA and cholesterol raise the plasma cholesterol levels. In the present study, it was seen that food items like rice, vegetables, milk, coconut, oil and beverages like tea/coffee were used daily by all the respondents. Sugar was exlcuded by all the diabetic patients. Milk and sugar formed only an ingredient of tea/coffee on a daily basis. Roots and tubers also found a place in their dietary. This result is in accordance with the result of a study conducted by Amrithaveni and Srividhya (1999) in Coimbatore.

It was also observed that complete non-vegetarians (respondents who consumed meat, egg and fish) had the highest calorie intake compared to strict vegetarians.

Rice being the staple food in the state, it was used by all the respondents. The maximum calorie intake from rice was noted among complete non-vegetarians (egg + fish + meat), while the intake was minimum among strict vegetarians.

Ingestion of a diet containing calories in excess of the daily requirements for maintenance and physical activity in the form of refined carbohydrates leads to an elevated cholesterol and TG level, which also have been implicated in the onset of atherosclerosis (Harley et al., 1986). On the contrary, the energy intake from wheat was maximum among strict vegetarians compared to other categories. It was observed that only 2 per cent of the respondents used ragi in their diets. Vijayagopalan et al. (1973) observed that ragi and tapioca, which were least digested and had higher cholesterol lowering action, while the more digestible starches showed lower effect. About 40 per cent of the respondents surveyed had the habit of using tapioca once in a while.

Different types of pulses like red gram, green gram, bengal gram, black gram and green peas were used by most of the respondents atleast once in a week. It was noted that complete non-vegetarians consumed pulses more frequently and stood first quantity wise also. Susan et al. (1989) reported that whole legumes were effective cholesterol lowering agents when consumed on a habitual basis. Most of the respondents disliked pulses because of the development of flatulence. The gas forming nature of most pulses is a drawback in its consumption, reports Achaya (1995).

Another observation made was the maximum intake of leafy vegetables by the strict vegetarians compared to other groups. In general, the intake of leafy vegetables did not meet the RDA (Recommended Dietary Allowance) required. This may be due

to lack of awareness, availability or ignorance. Amaranthus was the most widely used leafy vegetable.

Roots and tubers, the most economical source of carbohydrate, was used four times a week on an average. Tapioca, yam, colocasia, beetroot, carrot and potato were the main item used by the respondents. Maximum quantity of roots and tubers were consumed by ovo-vegetarians, whereas the least was observed among respondents who took egg and fish in their diet.

A striking result found was that the frequency of consumption of other vegetables was maximum among these taking fish composed to strict vegetarians, but the quantity of vegetables consumed was the highest among vegetarians compared to other categories. Esselstyn (2000) also suggests that sticking to a plant based diet can eliminate the chances of developing coronary heart diseases.

The intake of fruits were restricted to once in a week by majority of the families due to their poor economic status. About 3 per cent of the respondents consumed fruits daily. Plantain was the most commonly used fruit. Ovo-vegetarians consumed the maximum quantity of fruits on a weekly basis.

Milk was used by almost all the respondents as an ingredient in tea/coffee. The frequency of using milk varied from two to three times per day. Maximum quantity of milk was used by ovo-vegetarians, but frequency wise, vegetarians stood at the top. Milk products like curd and buttermilk were used by most of the respondents (about 75

per cent), but cheese was not used by any respondent. The typical Kerala diet does not include cheese. Ghee and butter were found to be used occassionally.

Among non-vegetarian foods chicken, mutton and beef were not included in the daily diet by any of the respondent. This may be due to the expense or advise of the physician. Eleven per cent of the respondents used fish alone in addition to vegetables, while 2 per cent were strict ovo-vegetarians. The average weekly frequency of consuming meat was found to be two among non-vegetarians. Majority (88 per cent) of the respondents included fish in their diet daily or atleast five times a week. This may be due to increased availability or awareness about the beneficial effects of fish and fish oils in heart diseases.

Coconut formed an integral part of the daily diet among all the respondents, the frequency per week ranging from 13 to 17. It was obsreved that ovo-vegetarians used the maximum quantity of coconut.

Regarding oil, coconut oil was the most frequently used oil followed by palm oil and sunola. Oil was used more frequently by non-vegetarians compared to others, while maximum calories (quantity) from oil was consumed by respondents who used egg and fish in their daily diet.

Sugar was used by all the non-diabetic respondents. Maximum frequency and quantity consumed was observed among complete non-vegetarians. Only a minorproportion of the respondents were in the habit of using confectionary and processed foods, maximum being found among non-vegetarians.

Complete non-vegetarians used beverages more frequently and in increased quantity. Tea and coffee, with or without milk were the most commonly used beverages.

**Type and quantity of oil consumed by the respondents**

Ghafoorunissa (1992) remarks that the quantity and quality of dietary fat alter serum lipid fractions, which in turn play an important role in the precipitation of CVD.

In the present study, majority (71 per cent) of the respondents were in the habit of using coconut oil for cooking purposes. Research findings indicate that the short and medium chain fatty acids present in coconut oil, rapidly absorbed, digested and asimilated in the human body will not cause blood abnormality which are usually associated with the consumption of SFA from other sources (Kurup and Rajmohan, 1996). It was observed that none of the respondents were in the habit of using gingely oil or any mixed oil. Two patients used rice bran oil. They are NRI (Non-Resident Indians) citizens and used to rice bran oil. The quantity of oil used per month also varied from less than one kg to above three kg.

## 5.4 Life style pattern of the respondents

The lifestyle pattern of a patient reflects his/her physiological as well as the psychological health. Smoking, alcoholism, sedentary life, anxiety, stress and strain

can all lead to a troublesome life. Under life style pattern, details regarding alcohol consumption, smoking, exercise, mental stress and strain were collected.

**Alcohol consumption**

According to Ghafoorunissa and Krishnaswamy (1995), alcoholic beverages like whisky, brandy, rum, wine and beer increases the blood pressure, weakens the heart muscle and leads to a pathological condition known as alcoholic cardiomyopathy. The interview revealed that 27 per cent of the respondents were users of alcohol, 59 per cent were non-users and 15 per cent were ex-alcoholics. The respondents used alcoholic beverages such as whisky, rum, brandy and toddy. Majority of the alcoholics (33 per cent) used brandy, followed by toddy and whisky, which constituted 23 per cent.

With respect to the quantity, majority of the alcoholics (60 per cent) used less than 200 ml. of alcoholic beverages each time they drank. Most of them had the wrong notion that alcohol in small quantities was beneficial to the heart.

**Smoking**

Data on the smoking habit of the respondents in relation to the type and number of cigarettes smoked per day revealed that 49 (33 per cent) respondents were smokers, while 25 per cent were ex-smokers. Only 5 (3 per cent) male respondents were non-smokers along with all the female respondents surveyed. Majority of the smokers were in the habit of using cigarette because they thought beedi was more harmful compared

to cigarette. Smoking affected their taste sensation and this may be a reason to stick on to a high fat diet. Thompson et al (1995) are of the opinion that the increased risk of heart disease in cigarette smokers may be partially explained by their less healthy diets and in particular lower intake of linoleic acid.

**Exercise**

In the present study, it was observed that only 31 per cent of the respondents were in the habit of doing exercise. Studies revealed that the incidence of IHD was high among those leading a sedentary life and low among individuals leading an active life (Swaminathan, 1995).

**Mental stress and strain**

The survey revealed that 60 per cent of the respondents had financial problems, while 30 per cent had problems in their occupational field. 22 per cent of the respondents had problems related to health and old age, while 18 per cent of the respondents had some kind of family problem. Only a minority (8 per cent) responded that they did not have any specific problem. Taylor *et al.* (1998) are of the opinion that psychological and emotional stress is often an important factor in triggering attacks of angina.

In the present study, it was observed that majority (86 per cent) of the respondents were subjected to various kinds of worries, fear and tension. 36 per cent of the respondents had insomnia (inability to sleep sufficiently), while 57 per cent of

them complained of sweating and flatulence. General weakness was common among all the respondents surveyed. Depressed mood and early waking were reported by 24 per cent of the respondents. Stress forms an important cause for heart diseases, blood pressure, depression and fatigue along with other diagnosis (Andrews, 1997).

### 5.5 Blood lipid profile of the respondents

The survey revealed that 90 per cent of the respondents had TC above the normal value. Regarding TG, 83 per cent were having hypertriglyceridemia. The magnitude of the increase in plasma TG following a meal is recognised to be an important risk marker for CHD, reports Dubois *et al.* (1998).

In the present study, it was seen that 90 per cent of the respondents had HDL cholesterol below the normal value and 70 per cent of the respondents had LDL cholesterol above the normal value. Higher TG levels are frequently accompanied by lower HDL cholesterol levels and higher total cholesterol/HDL cholesterol ratios (Truswell, 1994), as well as increased levels of LDL cholesterol (Stampfer et al., 1996 and Shepherad et al., 1987).

### 5.6 Association of dietary and non-dietary factors to blood lipid profile

#### 5.6.1 Association of personal characteristic to blood lipid profile

The correlation between the personal characteristics such as age, food habit, duration of exercise, quantity of alcohol and number of cigarettes per pay - with blood lipid constituents - TC, TG, HDL, LDL and VLDL - had been worked out.

It was observed that there was significant negative correlation for age against TC and LDL. A highly significant correlation (0.4059) was noted between food habit and LDL. It was also observed that there was significant correlation for food habit against TC and VLDL, and negative correlation for food habit against TG and HDL.

No significant correlation was observed between blood lipid profile and duration of exercise, except with LDL (-0.174). Harley et al. (1986) reported that runners weighted less and had higher plasma HDL cholesterol and lower LDL cholesterol level than inactive women.

Similarly a negative correlation (-0.1676) was noted between quantity of alcohol consumed and TC. Significant negative correlations were observed for number of cigarettes used per day against TC and LDL values.

Michael et al. (1986) is of the opinion that low or subnormal LDL levels were reported to be a characteristics of the lipoprotein pattern in chronic alcoholics.

**5.6.2 Correlation between energy index and blood lipid profile**

Highly significant correlation for energy index against TC, LDL and VLDL cholesterol, indicates the need for restricting calorie in the diet.

**5.6.3 Association of blood lipid profile with the different food items consumed**

The food consumption pattern of the respondents was recorded and correlation between the blood lipid constituents and different food items consumed was worked

out. Consumption of rice was found to be significantly correlated with TC and LDL cholesterol.

Regarding wheat, significant negative correlations were worked out with respect to TC and LDL cholesterol. Prina et al. (1981) reported that the increased faecal secretion of cholesterol and bile acids induced by the gluten diet in growing rats represents the main mechanism of the hypocholesterolemic effect of wheat-gluten diet.

No significant correlation was observed between blood lipid profile and consumption of pulses. Regarding consumption of leafy vegetables, significant negative correlation was observed with TC and LDL cholesterol and a significant positive correlation with HDL cholesterol. Leafy vegetables are rich in minerals like magnesium. Nalini and Radha (1989) had observed that in rats, magnesium deficiency resulted in an increase in the serum cholesterol, TG, LDL and VLDL cholesterol.

There was no significant correlation between consumption of roots and tubers with blood lipid profile. This is contradictory to the findings of Prema and Kurup (1979) who observed that starch from arrowroot, sweet potato tapioca and diascorea showed significantly lower levels of serum cholesterol when compared to others.

Significant negative correlation was worked out between consumption of other vegetables with TG and HDL. Thorogood et al. (1987) reported a lower cholesterol concentration in vegetarians compared to those who eat meat. A significant correlation was observed between consumption of fruits and level of VLDL.

Examination of the lipid profiles of respondents with severe CAD, who followed a plant based diet containing less than 10 per cent fat and took cholesterol- lowering medication, showed that their disease had established and in some cases it had selectively been reversed (Mahadevan, 2000 and Stampfer, 1995 b).

Regarding the consumption of milk, a significant correlation was observed with respect to level of HDL cholesterol in blood. Girija Devi (1985) had reported that in populations living on diets containing animal foods and dairy products, the serum cholesterol level and the incidence of heart diseases are high. But in the present study, no significant correlation was observed between consumption of dairy products and blood lipid profile. Studies carried out by Kochar (2000) on the effect of additional intake of milk on blood pressure and plasma cholesterol revealed that cream less milk and its products had hypercholesterolemic effect only in hypertensive subjects and not in normo-tensive subjects.

Significant positive correlations were observed for consumption of meat against TG, LDL and VLDL, and a negative correlation against the level of HDL in blood. Enholm et al. (1982) found that a diet rich in animal fat causes hypercholesterol. Data on individual fatty acids suggest an association between risk of CVD and 16:1 trans fatty acid, which comes to a great extent from animal sources (Siguel and Lerman, 1993).

A significant result obtained was the negative correlation of egg consumption with TG and VLD values.

Highly significant positive correlations were noted between consumption of fish with TC and LDL-cholesterol. A significant negative correlation between fish consumption and level of HDL was also observed. Studies conducted by Ramadas and Easwaran (2000a) revealed that when fish was withdrawn from the diets of non-vegetarians, the TC and LDL levels increased, while HDL remained the same in both the sexes. In 1998, the Physician's Health study found that men who ate fish atleast once a week had a 50 per cent lower risk of sudden cardiac death (Guallar et al., 1995). Some studies suggest that omega-3 present in fish may be beneficial because they modulate electrical activity in the heart, thus making the heart less susceptible to dangerous rhythm abnormalities and not by lowering blood cholesterol and TG (Bharathi, 1999; Pauline and John, 1986).

Regarding the consumption of coconut, significant correlations were observed with respect to the level of TC and LDL in blood. Ramadas and Easwaran (2000b) reported that when coconut kernel was obtained from the diets of coconut oil consumers for 30 days, the TC and LDL levels in male vegetarians increased by 0.8 and 1.8 mg/dl whichmay be attributed to the absence of fibre from coconut kernel. But this was not statistically significant. Contrary to this, among female vegetarisn, the levels of TC, LDL and TG decreased by 2.6, 5.8 and 1.0 mg/dl respectively.

Significant correlations were obtained with respect to oil consumption against TC, TG and VLDL levels. Merk and Lynne (1988) reported that there was a significant positive correlation between consumption of saturated fat and cholesterol

and international mortality from CHD. Mensik and Katan (1992) reported a positive correlation between high saturated fat intake and elevated serum cholesterol concentrations. They had also remarked that the quantity and quality of dietary fat alter serum lipid fractions, which in turn play an important role in the precipitation of heart diseases.

Regarding the consumption of sugar, significant positive correlations were observed with respect to TG and VLDL levels. Excess sugar and alcohol not utilised as energy by the body eventually turn into saturated fat (John and Lavon, 1984).

Significant negative correlations were noted for processed foods and confectionary consumption against TC and LDL. These do not have a direct association with the blood lipid profile. Processed foods and confectionary may vary and the risk factor is directly proportional to the quantity and quality of ingredients used in its preparation (Sharma, 1989b).

Regarding the consumption of beverages like tea/coffee, highly significant positive correlations were observed with respect to TG and VLDL levels. Srimathi et al. (1981) reported that both coffee and tea appears to cause an increase in serum lipids and lipoproteins. Green and Jucha (1986) and Kark et al. (1985) have indicated an association between coffee intake and increased levels of serum cholesterol in men and women. Michael (1994) reported that flavanoid intake may reduce elderly men's risk of dying from CHD. Tea contains 61 per cent flavanoids.

### 5.6.4 Association between quantity of food consumed and calorific value

Highly significant positive correlations were observed in calorific value with respect to quantity of rice, pulses, milk and milk products, fish, coconut, oil, sugar and tea consumed.

## 5.7 Conduct of diet counselling

**General counselling**

150 respondents who were selected for the study were given general diet counselling and subjected to pre and post-knowledge tests. It was observed that 90% of the respondents had gain in knowledge following the counselling programme.

**Adoption rate of respondents**

The rate of adoption was also high among 70% of the respondents. As quoted in the previous studies (Razeena, 2000), a positive effect in the rate of adoption was observed. From this 70 per cent, 30 respondents were selected for intensive diet counselling.

**Intensive diet counselling**

Intensive diet counselling was given to 30 respondents who were subjected to knowledge and adoption tests. Estimation of blood lipid profile revealed a significant reduction in the values. This is in accordance with the findings of Clara (1986) who reported that diet counselling is necessary to lower the blood lipids and to maintain the normal levels in atherosclerotic respondents.

## 5.8 Evaluation of the impact of reversal diet

The impact of the reversal diet was assessed with respect to:

### 5.8.1 Rate of adoption

Majority of the respondents adopted more than 70 per cent of the knowledge disseminated through counselling, while 7 (23%) respondents adopted between 50 and 70 per cent and only 1 respondent scored below 50 per cent. The Lifestyle Heart Trial, which is an intensive programme of dietary counselling, stress management and moderate exercise, reduced subjects' fat intake from 32 per cent to 7 per cent of calories, which resulted in weight loss of 11 kg after the first year of intervention. At the 5-year follow-up, no further weight loss was noted, but participants indicated continued adherence to the programme, including the very low fat diet (Ornish et al., 1990).

### 5.8.2 Gain in knowledge

The knowledge gain of the respondents was assessed by conducting pre-test and post-test prior to and after the counselling. The results were statistically analysed. It was observed that all the 30 respondents who had undergone intensive diet counselling had scored high marks, which indicates the gain in knowledge. The results coincide with those of Cicil (2000) and Razeena (2000) who reported that intervention programmes positively affect the knowledge of the respondents.

### 5.8.3 Change in blood lipid profile

The initial and final blood lipid profile of the respondents selected for intensive diet counselling were estimated. The results showed that there was significant difference between the initial and final values. Kasim et al. (1993) in their study have found that as a result of diet counselling, fat intake was reduced from 36 per cent to 18 per cent of calories and thus able to maintain the normal level of blood lipids in atherosclerotic respondents.

Significant reduction in the blood lipid profile due to counselling and food supplementation was also reported by Amrithaveni et al. (2001) in a study on the effect of supplementation of Kadukkai on hypercholesterolemic patients. The initial mean value for TC was 219 mg/100 ml, which was reduced to 213 mg/100 ml after the study period. Estimation of TC alone is less useful in predicting the risk of CHD. But the TG and LDL values are more useful in predicting the risk.

In the present study the TG and LDL have significantly reduced from 141 and 156 mg/100 ml to 136 and 150 mg/100 ml after the study period. The diet consumed by the respondents was rich in dietary fibre and low in fat, which may be the reason for this favourable result.

Mazur et al. (1990) has reported that extensive studies in experimental animals indicate that the addition of plant fibres to the diet is accompanied by significant reduction in serum cholesterol concentration.

The reversal diet is a vegetarian diet with minimal quantity of dairy products. This also helped for the significant positive changes in blood lipid profile of respondents. Thorogood et al. (1987) support the beneficial effect of vegetarian diet and Devadas et al. (1980) support the beneficial effect of low diary product diet for cardiac patients in their studies. The results of the present study are also in line with these findings.

Chronic diseases are multifactorial in origin and therefore require a complex mix of interventions. A wide selection of foods from each of the different food groups to ensure a balanced diet, and avoidance of over-indulgence in foods can maintain health and prevent diseases like CVD, stroke, diabetes and cancer.

# SUMMARY

# SUMMARY

The present study on "Standardisation of reversal diets for cardiac patients" was undertaken with an objective to standardise reversal diet which suited Kerala conditions and to assess its impact on the blood lipid profile of selected cardiac patients through intensive diet counselling.

Based on the principles of the reversal diet and traditional recipes of Kerala, reversal diets low in fat, high in fibre, without any stimulants and fleshy foods and moderate amounts of salt and sugar were planned.

A seven day's menu was formulated by modifying the normal diets of Kerala to meet the needs of cardiac patients with reference to nutritional requirement and variety. The menu included recipes for breakfast, lunch and dinner along with snacks and beverages.

Three types of menu - 1000 Kcal., 1250 Kcal. and 1500 Kcal.- were planned on the basis of total calorie requirement. Quantity of each item in the menu was also worked out. Each recipe selected under the seven-day's menu was worked out with respect to the quantity of raw ingredients, salt and fat added and the major cooking method adopted.

A ready- reckoner was formulated which explained in detail the raw ingredients, their quantity, method of cooking as well as the cooked volume of the product. A booklet on 'Diet and Cardiac Diseases' was prepared which included a diet chart also.

The nutritive value of the diet was computed with the aid of food composition table. The modified diet contained about 1000 to 1500 Kcals., 35 to 45 g protein, 10 to 20 g fat and 20 to 30 g fibre.

A data -base survey was conducted at three hospitals in Thiruvananthapuram city namely Medical College Hospital - Thiruvananthapuram, Al-arif Hospital - Ambalathara and P.R.S Hospital - Killipalam. The data were collected from 150 respondents who attended the cardiac clinic in these hospitals. Details regarding their socio-economic status, dietary pattern and life style were collected. All the respondents were given a general counselling.

It was observed that from among the total 92 males and 58 females who were surveyed, 53 per cent of the males and 55 per cent of the females experienced the first incidence of cardiac disease between 30 and 60 years. 40 per cent of the males and 32 per cent of females had the first attack after the age of 60. Religionwise distribution showed that 60 per cent were Hindus, 23 per cent Muslims and 17 per cent Christians. 81 per cent of the respondents belonged to nuclear family while 19 per cent came from joint family.

Regarding the economic status of the respondents, 30 per cent had income between Rs.1001 to 2000, 19 per cent between Rs. 2001 and 3000 and 16 per cent between Rs.4001 and 5000, which shows that majority of the respondents surveyed belonged to the low income group.

Data regarding the food habit of the respondents showed that 51 per cent were complete non-vegetarians followed by 19 per cent respondents consumed fish and meat. Strict vegetarians comprised 9 per cent followed by 2 per cent ovo-vegetarians and 11 per cent respondents who took fish only.

The data revealed that complete non-vegetarians consumed maximum quantity of rice compared to strict vegetarians who had the least score. It was also observed that most of the families included leafy vegetables, roots and tubers and fruits once in a week only. Strict vegetarians consumed maximum quantity of vegetables, while ovo-vegetarians consumed the maximum quantity of vegetables, roots and tubers. Frequency of using milk ranged from two to three times a day. Most of the families consumed milk products like curd and buttermilk along with occasional use of ghee and butter.

Fleshy foods had not been included daily partly being expensive and partly due to the advice of the physician. Majority of the respondents were in the habit of including fish in their diet daily. Coconut was an inevitable item in the diets of

all the families; frequency of consumption per week ranging from 13 to 17. Oil was used more frequently by complete non-vegetarians. Sugar was used by about 70 per cent of the respondents. Only a minor sample were in the habit of using confectionary and processed foods, maximum being found among non-vegetarians. All the respondents used beverages like tea/coffee.

The type of oil used for cooking varied between the respondents. About 71 per cent of the respondents used coconut oil only while 17 per cent used both coconut oil and palm oil. Palm oil alone was used by 7 per cent of the respondents followed by 5 per cent who used sunflower oil and 1 per cent who used rice bran oil. Gingily oil was not used by any respondent.

Results of the initial blood analysis showed that the TC level of the respondents ranged from 158 mg to 323 mg/100ml, TG value between 82 mg and 225 mg/100ml, HDL value between 30 mg and 60 mg/100ml and LDL value between 130 and 220 mg/100ml.

Regarding the life style pattern of the patients, data regarding alcohol consumption, smoking habits and exercising were collected. The data showed that there was highly significant correlation between age and total cholesterol and age with LDL cholesterol. A highly significant positive correlation was observed between food habit and total cholesterol, LDL and VLDL values. No significant correlation was noted between blood lipid profile and duration of exercise done except with LDL

values (-0.1740). Significant correlations were observed between number of cigarettes smoked per day with total cholesterol and LDL values.

The calorific value of the diet consumed by each patient was calculated and the energy index thus developed was correlated with the blood lipid profile of the patients. A highly significant correlation was observed between total cholesterol and LDL values with the energy index. Correlation of different food items with the blood lipid profile revealed that there was highly significant negative correlation between consumption of fish with total cholesterol (-0.4475) and LDL values (-0.5698).

After the initial survey and general counselling, a sub sample of 30 subjects were selected who satisfied the inclusion criteria such as respondent's willingness, higher adoption rate, uniform medication and severity of the disease. These respondents were given intensive diet counselling.

The intensive diet-counseling programme was scheduled for two consecutive days for the patients along with their spouses. Prior to this, the initial blood lipid profile of the 30 respondents was estimated. The counselling session started with a pre-test to assess the extend of awareness of the patients regarding diet and cardiac disease. Following this was the lecture and the demonstration. On the next day, question-answer session was held during which the doubts raised by the respondents were clarified. After this, post-test was conducted with the same set of statements used for pre-test to evaluate the gain in knowledge after the counseling. Low, medium and high knowledge scores were assessed by calculating standard deviation and mean. The

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results of post-test showed that all the 30 respondents who were given intensive diet counselling scored above 45 out of 50. Thus 100 per cent of the respondents who had undergone the counseling programme had scored high marks, which revealed their knowledge gain.

The respondents were requested to follow the modified diet strictly for a period of 3 months. After this time span, the blood samples were again collected and estimated for blood lipid profile. The initial and final blood lipid values were statistically analysed using 'paired t-test'. Results indicated that there is significant difference between the initial and final blood lipid values which reveals the impact of reversal diet in the management of heart diseases, and it cold be concluded that 'Reversal diet' is the best method of diet therapy for cardiac patients.

The adage "Prevention is better than cure" is particularly appropriate for cardiac diseases since the cost of treatment far outweighs the cost of diseases prevention. Combating heart disease is expensive and it would be to our advantage to prevent the disease through several available approaches. In the interim, a limited group of motivated, high-risk persons with hypercholesterolemia may benefit from very low fat diets, but only with support, careful supervision and regular follow-up by the healthcare providers.

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# APPENDICES

## Appendix I

## MENU

### 1000 Kcals. Diet

**Day 1**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Idiappam (2 nos.), Tomato-Dal mashed (2 tbsp) |
| Midmorning | Carrot juice (1/2 cup) |
| Lunch | Rice (1 cup), Amaranth-dal curry (1/2 cup), Vegetable soup (1 katorie), Tomato-carrot salad. |
| Tea | Light tea, Vegetable upma |
| Dinner | Broken wheat gruel (1 katorie), Carrot pugath (1/2 katorie), Orange (1) |

**Day 2**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Oats porridge (1 cup), Boiled banana (1) |
| Midmorning | Tomato juice (1/2 cup) |
| Lunch | Lime rice (1 cup), Cowpea pugath (1/2 cup), Buttermilk (1/2 cup), Carrot-cucumber salad |
| Tea | Light tea, Arrowroot biscuit (2) |
| Dinner | Wheat dosa (2), Gobi masala (¾ katorie), Milk (1/2 cup) |

**Day 3**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Paratha (2), Vegetable kurma (1/2 katorie) |
| Midmorning | Lime juice |

| | |
|---|---|
| Lunch | Red gram dal rice (1 katorie), Pulissery, Chekkurmanis pugath (1/2 katorie), Carrot-radish salad |
| Tea | Light tea, Sundal |
| Dinner | Rice gruel (1 cup), Boiled green gram (1/2 katorie), Tomato- cucumber salad. |

**Day 4**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Barley (1 cup), Boiled banana (1) |
| Midmorning | Pineapple juice (1 glass) |
| Lunch | Rice (1 katorie), Green gram pugath (1/2 katorie), Avial (1 katorie) |
| Tea | Light tea, Ada (1) |
| Dinner | Chapathi (2), Soyabeans curry (1/2 katorie), Plantain (1). |

**Day 5**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Puttu (1/2), Green peas curry (1/2 katorie) |
| Midmorning | Carrot juice (1/2 cup) |
| Lunch | Rice (1 katorie), Sambar (1/2 katorie), Drumstick leaves pugath (1/2 katorie), Tomato-carrot salad. |
| Tea | Light tea, Rice flakes upma (1 katorie) |
| Dinner | Dosa (2), Tomato-dal mashed (1/2 katorie) |

Day 6

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Idli (2), Sambar (1/2 katorie) |
| Midmorning | Vegetable soup (1/2 cup) |
| Lunch | Mixed vegetable pulao (1 katorie), Cucumber raita (1/2 cup), Cabbage pugath (1/2 katorie) |
| Tea | Light tea, Vegetable sandwich (1 slice) |
| Dinner | Puttu (1/2), Boiled green gram (1/2 katorie) |

Day 7

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Kuskus porridge (1 cup), Boiled banana (1) |
| Midmorning | Tender coconut water (1 glass) |
| Lunch | Rice (1 katorie), Green gram-pumpkin curry (1/2 katorie), Amaranth pugath (1/2 katorie), Tomato-cucumber salad. |
| Tea | Light tea, French toast (1 slice) |
| Dinner | Oats porridge (1 cup), Boiled banana (1/2). |

## 1250 K Cals. Diet

| | |
|---|---|
| **Day 1** | |
| Bed tea | Light tea |
| Breakfast | Idli (3) nos, Sambar (1 ½ katorie) |
| Midmorning | Tomato juice (1 ½ glass) |
| Lunch | Rice (1 ½ cup), Avial, Buttermilk (1 glass), Carrot – cucumber salad |
| Tea | Light Tea, Ada (1 ½) |
| Dinner | Paratha (2), Mashed dal |
| **Day 2** | |
| Bed tea | Light tea |
| Breakfast | Puttu (60 g), Boiled green gram (25 g) |
| Midmorning | Papaya (2 pieces) |
| Lunch | Rice (60 g), Vegetable soup (1 katorie), Drumstick leaves-pugath (1 Katorie),Rasam, Tomato-cucumber salad. |
| Tea | Light tea, Arrowroot biscuits (2) |
| Dinner | Broken wheat gruel (50 g), Carrot pugath (25 g). |
| **Day 3** | |
| Bed tea | Light tea |
| Breakfast | Idiappam (3), Green peas curry (1 katorie) |
| Midmorning | Carrot juice (1 ½ glass) |
| Lunch | Rice (50 g), Amaranth pugath, Vegetablecurry, Tomato-carrot salad, Buttermilk (1 cup) |
| Tea | Light tea, Sundal |
| Dinner | Wheat dosa (2), Vegetable kurma |

**Day 4**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Oats porridge (25 g), Plantain |
| Midmorning | Tender coconut water, Biscuits (2) |
| Lunch | Rice (60 g), Sambar, Snake gourd pugath, Tomato-carrot salad. |
| Tea | Light tea |
| Dinner | Chapathi (2 ½), Gobi masala. |

**Day 5**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Vegetable upuma, Plantain. |
| Midmorning | Pineapple juice |
| Lunch | Red gram dal rice, Drumstick pugath, Carrot-tomato salad. |
| Tea | Light tea, Boiled banana |
| Dinner | Wheat dosa (2), Soyabeans curry |

**Day 6**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Barely gruel, Plantain |
| Midmorning | Lime juice |
| Lunch | Rice (60 g), Rasam, Avial, and Drumstick leaves pugath |
| Tea | Light tea, Veg.Sandwich |
| Dinner | Chapathi (2), Tomato-dal mashed. |

**Day 7**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Idli (3), Sambar |
| Midmorning | Carrot juice |
| Lunch | Rice (50 g), Pulissery, Cowpea pugath, Carrot-cucumber salad |
| Tea | Light tea, Rice flakes upuma |
| Dinner | Oats porridge, Plantain. |

## 1500 K Cals. diet

| | |
|---|---|
| **Day 1** | |
| Bed tea | Light tea |
| Breakfast | Puttu (60 g), Boiled green gram |
| Midmorning | Carrot juice |
| Lunch | Rice (60 g), Amaranth-dal curry,<br>Cabbage pugath, Carrot- cucumber salad |
| Tea Light | Tea, Boiled banana (1/2) |
| Dinner | Chapathi (2), Gobi masala |
| **Day 2** | |
| Bed tea | Light tea |
| Breakfast | Kuskus Porridge, Banana boiled |
| Midmorning | Vegetable soup |
| Lunch | Mixed Dal rice, Carrot raita, Buttermilk,<br>Tomato-cucumber salad |
| Tea | Light tea, Ada |
| Dinner | Chapathi (2), Mashed dal. |
| **Day 3** | |
| Bed tea | Light tea |
| Breakfast | Paratha (3), Veg.kurma. |
| Midmorning | Tomato juice |
| Lunch | Rice (50 g), Avial,<br>Cabbage pugath, Carrot raita |
| Tea | Light tea, French toast (egg white) |
| Dinner | Rice gruel (50 g), Green gram pugath |

**Day 4**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Oats porridge, Boiled Banana (1) |
| Midmorning | Lime juice with glucose |
| Lunch | Rice (50 g), Amaranth-dal curry,<br>Cabbage pugath, Buttermilk. |
| Tea | Light tea, Rice flakes upuma |
| Dinner | Broken wheat gruel, Carrot pugath. |

**Day 5**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Kuskus porridge, Boiled Banana |
| Midmorning | Vegetable soup |
| Lunch | Lime rice (50 g), Drumstick leaves pugath<br>Tomato-cucumber salad. |
| Tea | Light tea, Veg.sandwich. |
| Dinner | Wheat dosa (2), Gobi masala |

**Day 6**

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Puttu (60 g), Green peas curry. |
| Midmorning | Tomato juice (2 glass) |
| Lunch | Rice (50 g), mashed dal-tomato, Pumpkin curry,<br>Carrot-cucumber salad |
| Tea | Light tea, Vegetable upuma |
| Dinner | Chapathi (3), Peas curry |

Day 7

| | |
|---|---|
| Bed tea | Light tea |
| Breakfast | Dosa (3), Vegetable kurma |
| Midmorning | Pineapple juice |
| Lunch | Rice (50 g), Sam bar and Chekkurmanis pugath<br>Tomato-carrot salad |
| Tea | Light tea, Ada |
| Dinner | Rice gruel, Boiled green gram. |

## Appendix II

## A. READY RECKONER

### Tea

| Ingredients | Amount |
|---|---|
| Skimmed milk powder | 2 tsp (10 g) |
| Water | 1/4 cup (40 ml.) |
| Tea dust | ½ tsp (3 g) |
| Water | 1/2 cup (100 ml.) |
| Sugar | 1 tsp (5 g) |

Method: - Boil 100ml. Of water in a teakettle. Mix the skimmed milk powder and hot water. Add tea dust to the boiling water. Pour the skimmed milk to the black tea. Add sugar. Serve hot.

Final volume: - 1 cup (200 ml.)

### Carrot juice

| | |
|---|---|
| Carrot (diced) | 8tbsp (125 g) |
| Water | 3/4 cup (150 ml.) |
| Sugar | 2 tsp (10 g) |

Method: - Put the diced carrots and water in the mixer-grinder. Sieve the mashed carrots and extract the juice. Add sugar.

Final volume: - 1 glass (200 ml.)

### Tomato juice

| | |
|---|---|
| Tomato | 2 nos. (150 g) |
| Water | 1/2 cup (100 ml.) |
| Sugar | 1 tbsp (5 g) |

Method: - Mix all the ingredients in a mixer. Cool and serve.

Final volume: - 1 glass (200 ml.)

## Lime juice

| | |
|---|---|
| Lime extract | 2tsp (10ml) |
| Water | 1 cup (200 ml.) |
| Sugar | 1 tbsp (15 g) |

Method: - squeeze the lime. Add water and sugar to the extract. Mix well.

Final volume: - 1 ¼ glass (250 ml)

## Kuskus porridge

| | |
|---|---|
| Kuskus | ¼ cup (50 g) |
| Skimmed milk powder | 2 tsp (10 g) |

Method: - Soak kuskus overnight in about ¾ cup water .Mix skimmed milk powder in 40 ml hot water. Boil kuskus in skimmed milk and make it into the consistency of porridge. Add sugar and serve hot.

Final volume: - 1 glass (200ml)

## Idiappam

| | |
|---|---|
| Rice flour | 5 tbsp (80 gm) |
| Water | 1/4 cup (50 ml) |
| Salt | a pinch |

Method: - Mix all the ingredients to get a fine paste. Extrude this paste through a 'sevanazhi' and steam it in an idli-cooker.

Final volume: - 3 nos (100 g)

## Idli

| | |
|---|---|
| Black gram dal | 2tbsp (10 g) |
| Rice, raw | 2tbsp (10 g) |
| Rice, white | 30g (2 tbsp) |
| Salt | to taste. |

Method: - Grind black gram dal and rice separately to a fine paste. Mix them and add salt. Steam it in an idli-cooker.

Final volume: - 3 nos (120g)

## Vegetable upuma

| | |
|---|---|
| Rava | 4 tbsp (60 g) |
| Carrot | 5 tsp (25 g) |
| Beans | 5 tsp (25 g) |
| Onion, big | 5 tsp (25 g) |
| Ginger | 1 tsp (5 g) |
| Green chili | 1 no |
| Oil | ½ tsp (2 ml.) |
| Mustard | ½ tsp (2 ml.) |
| Curry leaves | 1 sprig |
| Water | 3/4 cup (150 ml) |
| Salt | to taste. |

Method: - Heat rava in a frying pan till light brown. Chop all the vegetables. Heat oil. Season with mustard and curry leaves. Sauté the onion and add vegetables. After 2 minutes, pour the water. Allow it to boil and then add the rava and salt. Cover and cook for about 10 mts.

Final volume: - 2 katories (175 g)

## Wheat dosai

| | |
|---|---|
| Wheat flour | ¼ cup (50 g) |
| Water | 3/4 cup (125 ml) |
| Oil | ½ tsp (2 ml) |

Method: - Mix enough water and salt to the wheat flour to get a free flowing batter. Smear hot thava with oil. Pour the batter. Cook on both sides until done. Serve hot.

Final volume: - 2 nos (130 g)

## Chapatti

| | |
|---|---|
| Wheat flour | 1/4 cup (50 g) |
| Water | 1/8 cup (30 ml) |
| Salt | to taste |

Method: - mix the ingredients to get soft dough. Spread it evenly on a chapathi-board. Transfer it to a hot thava and cook on both sides until done.

Final volume: - 2 nos (80 g)

## Puttu

| | |
|---|---|
| Rice flour | 1/4 cup (50g) |
| Water | 1/8 cup (25 ml) |
| Salt | to taste |
| Coconut | 1tsp(5 g) |

Method: - Add salt to rice flour and spread water evenly. Fill the mixture in a "puttu-kutti" by putting coconut in between. Steam for 5 minutes. Take it out from the puttu-kutti and serve.

Final volume: - ½ nos (90 g)

## Paratha

| | |
|---|---|
| Wheat flour | 1/4 cup (50g) |
| Water | 2 tbsp (30ml) |
| Salt | to taste |
| Oil | ½ tsp (2 ml) |

Method: - Knead the dough by adding water and salt. Spread it on a board. Transfer it to a hot thava smeared with oil. Cook on both sides until done.

Final volume 2 nos (120g)

## Rice

| | |
|---|---|
| Rice, parboiled | 3 ½ tbsp (50 g) |
| Water | 4 cups (800ml) |

Method: - wash the rice well. Boil the water and add the rice. Cook for about 1 hour. Strain the water.

Final volume: - 1¼ cups (250 g)]

## Red gram dal rice

| | |
|---|---|
| Raw rice (cooked) | 1/2 cups (80 g) |
| Red gram dal | 1/8 cup (25 g) |
| Chilli powder | ¼ tsp |
| Turmeric powder | a pinch |
| Oil | ½ tsp (2 ml) |
| Salt | to taste |
| Mustard | 1/8 tsp |

Method: - Cook the dal in a pressure cooker. Heat oil and season with mustard and curry leaves. Add the cooked dal, rice and salt. Mix well and serve hot.

Final volume: - 1 ½ katorie (120 g)

**Broken rice gruel**

| | |
|---|---|
| Broken rice | 1/5 cup (40 g) |
| Water | 1¼ cups (250 ml) |

Method: - Clean the rice and add to boiling water. Cook for about 1 hour. Serve hot.

Final volume; - 1½ cups (300ml)

**Lime rice**

| | |
|---|---|
| Rice, raw | ¼ cup (50 g) |
| Water | 1 ¼ cup (250 ml) |
| Lime juice | 1 tsp (5 ml) |
| Ginger (chopped) | 1 tsp (5 ml) |
| Green chilli | 1 no |
| Oil | ½ tsp (2 ml) |
| Salt | to taste |
| Mustard | ¼ tsp |
| Curry leaves | 1 sprig |

Method: - Cook the rice well. Heat oil. Season with mustard and curry leaves. Sauté ginger and green chilli. Add the cooked rice, limejuice and salt. Serve hot.

Final volume; - 2 katories (300 g)

**Avial**

| | |
|---|---|
| Cucumber (chopped) | 3 tsp (15 g) |
| Snake gourd (chopped) | 3 tsp (15g) |
| Raw banana (chopped) | 3 tsp (15 g) |
| Carrot (chopped) | 2 tsp (10 g) |
| Cluster beans (chopped) | 2 tsp (10 g) |
| Drumstick (chopped) | 2 tsp (10 g) |
| Brinjal (chopped) | 2 tsp (10 g) |
| Yam (chopped) | 2 tsp (10 g) |
| Coconut (scrapped) | 2 tsp (10 g) |
| Turmeric powder | a pinch |

| | |
|---|---|
| Green chilli | 2 nos |
| Small onion | 2 nos |
| Jeera | ¼ tsp |
| Curry leaves | 1 sprig |
| Tamarind juice | 1 tsp (5 ml) |
| Salt | to taste |

Method: - Cook all the chopped vegetables by adding salt and just enough water. Make the curry paste with coconut, turmeric powder, jeera, small onion, green chilli and curry leaves .mix the paste to the cooked vegetables add tamarind juice. Cook till done.

Final volume 1 ½ katories (150)

**Green gram pugath**

| | |
|---|---|
| Green gram | 1/8 cup (25 g) |
| Water | ½ cup (100ml) |
| Coconut | 1 tsp (5 g) |
| Jeera | ¼ tsp |
| Chilli powder | 1/4 tsp |
| Turmeric powder | 1/8 tsp |
| Garlic | 2 flakes |
| Salt | to taste |

Method: - Boil the green gram. Grind the coconut, chilli powder and turmeric powder along with jeera and garlic. Add this to the boiled green gram. Add salt also.

Final volume: - ¾ katorie (75 g)

**Green peas curry**

| | |
|---|---|
| Green peas | 2 tbsp (30 g) |
| Water | ½ cup (10 ml) |
| Coconut | 1 tsp (5 g) |
| Chili powder | ½ tsp (2 g) |
| Coriander powder | ½ tsp (2 g) |
| Oil | ½ tsp (2 ml) |
| Mustard | ¼ tsp |
| Curry leaves | 1 sprig |
| Salt | to taste |

Method: - Boil the green peas. Make a fin paste of coconut.chilli powder, coriander powder and cook it along with boiled green Pease. Add salt. Seasoned with oil, mustard and curry leaves

Final volume: - 1 katorie (130 g)

**Amaranth- dal curry**

| | |
|---|---|
| Red gram dal | 5 tsp (25 g) |
| Amaranth (chopped) | 5tsp (25g) |
| Coconut | 1tsp (5 g) |
| Chilli powder | ¼ tsp |
| Turmeric powder | a pinch |
| Jeera | 1/8 tsp |
| Garlic | 2 flakes |
| Mustard | ¼ tsp |
| Curry leaves | 1sprig |
| Oil | ¼ tsp (2 ml) |
| Salt | to taste |
| Water | ¾ cup (150 ml) |

Method: - Boil red gram dal and mash well. Heat oil and season with mustard and curry leaves. Add the cooked dal and salt along with chopped amaranth. Make a paste of coconut, chilli powder, turmeric powder, jeera and garlic. Mix the paste with the dal and amaranth. Cook for 3 mts.

Final volume: - 1 Katori (140 g)

**Sundal**

| | |
|---|---|
| Bengal gram, whole | 8 tsp (40 g) |
| Water | 1/2 cup (100 ml) |
| Mustard | 1/4 tsp |
| Curry leaves | 1 sprig |
| Oil | 1/2tsp |
| Salt | 1/2tsp |

Method: - Cook Bengal gram in a pressure cooker. Add salt. Season it with oil, mustard and curry leaves.

Final volume: - 1 ½ katorie (110 g)

## Amaranth pugath

| | |
|---|---|
| Amaranth (chopped) | 3½ tbsp (50 g) |
| Coconut | 2 tsp (10 g) |
| Chilli powder | 1/4 tsp |
| Turmeric powder | a pinch |
| Jeera | 1/8 tsp |
| Garlic | 2 flakes |
| Salt | 1g |

Method:- Cook amaranth by sprinkling water and salt. Grind coconut, chilli powder, turmeric powder, jeera and garlic. Add this to the cooked amaranth. Mix well and cook till done.

Final volume:- 1 katorie (70g)

## Chekkurmanis pugath

| | |
|---|---|
| Chekkurmanis (chopped) | 15 sprigs (25g) |
| Coconut | 1 tsp (5g) |
| Chilli powder | 1/4 tsp |
| Jeera | 1/8 tsp |
| Oil | 1/2 tsp |

Method: - Sauté the chekkurmanis. Grind coconut, chilli powder and jeera and add to chekkurmanis. Add salt and mix well.

Final volume: - 1 katorie (70g)

## Vegetable soup

| | |
|---|---|
| Carrot (chopped) | 3 tsp (15g) |
| Beans (chopped) | 3 tsp (15g) |
| Potato (chopped) | 3 tsp (15g) |
| Cucumber (chopped) | 3 tsp (15g) |
| Snake gourd (chopped) | 2 tsp (10g) |
| Big onion (chopped) | 3 tsp (15g) |
| Amaranth (chopped) | 2 tsp (10g) |
| Corn flour | 1/2 tsp (2g) |
| Pepper powder | 1/4 tsp |
| Salt | 1/2 tsp (2g) |
| Water | 1 cup (200ml) |

Method: - Boil the vegetables by adding water and salt. Mash the boiled vegetables. Add corn flour and season with pepper powder.

Final volume: - 1½ cups (300ml)

**Amaranth parartha**

| | |
|---|---|
| Wheat flour | 3 tbsp (45g) |
| Amaranth (chopped) | 4 tsp (20g) |
| Oil | 1/2 tsp |
| Salt | a pinch |
| Water | 1/8 cup (25ml) |

Method: - Sauté amaranth with salt. Knead it along with the wheat flour. Make balls out of it and press evenly on a chapathi board. Smear hot thava with oil and place the paratha on it. Turn it upside down and cook till done.

Final volume: - 2 nos. (100g)

**Rice flakes upuma**

| | |
|---|---|
| Rice flakes | 1/8 cup (25g) |
| Water | 1/8 cup (25g) |
| Coconut (scraped) | 1 tsp (5g) |
| Mustard | 1/8 tsp |
| Red chilli | 1 no. |
| Salt | 1g |
| Oil | 1/2 tsp |

Method: - Cook the rice flakes by sprinkling water. When done, season it with mustard and red chilli and add salt and coconut.

Final volume: - 1 katorie (75g)

**French toast**

| | |
|---|---|
| Bread | 2 slices |
| Milk | 1/4 cup (50ml) |
| Egg white | 1tsp |
| Sugar | 1/2tsp |

Method: - Beat egg white, sugar and milk. Soak the bread in this mixture. Toast it on a hot thava.

Final volume: - 2 slices (50g)

### Cornflakes porridge

| | |
|---|---|
| Milk | 3/4 cup (150ml) |
| Cornflakes | 1/8 cup (25g) |
| Sugar | 1/2 tsp |

Method: - Soak the cornflakes in boiled milk. Add sugar.

Final volume: - 1 cup (200ml)

### Tomato-cucumber salad

| | |
|---|---|
| Tomato | 1 medium (30g) |
| Cucumber | 1/4 medium (50g) |
| Onion | 1/2 medium (30g) |
| Lime juice | 1/2 tsp |

Method: - Slice the vegetables in a circular shape. Sprinkle limejuice if necessary.

### Cabbage pugath

| | |
|---|---|
| Cabbage (chopped) | 1/8 cup (30g) |
| Big onion | 1/2 medium (25g) |
| Coconut (scraped) | 1tsp (5g) |
| Green chilli | 1no. |
| Salt | 1/2 tsp |
| Oil | 1/2tsp |

Method: - Sauté onion, cabbage and green chilli. Add salt. When cooked, add the scraped coconut.

Final volume: -3/4 katorie (60g)

## Carrot raita

| | |
|---|---|
| Carrot (scraped) | 1/8 cup (25g) |
| Curd | 1/2 cup (100ml) |
| Salt | 1/4 tsp |

Method: - Steam the scraped carrot. Add the beaten curd and salt.

Final volume: - 1 cup (200ml)

## Oats porridge

| | |
|---|---|
| Oats | 2tbsp (30g) |
| Skimmed milk | 1/2 cup (100ml) |
| Water | 1/2 cup (100ml) |
| Sugar | 1tsp (5g) |

Method: -Cook oats in water. When done, add milk and sugar.

Final volume: -1 glass (200ml)

## Broken wheat gruel

| | |
|---|---|
| Broken wheat | 1/4 cup (50g) |
| Skimmed milk (50ml) | 1/4 cup |
| Water | 3/4 cup (150ml) |
| Sugar | 2 tbsp (10g) |

Method: - Boil broken wheat in water. When cooked, add milk and sugar. Serve hot.

Final volume: - 1½ cups (300ml)

## APPENDIX - III

## DIET EXCHANGE LIST

Foods providing 50 kcals (Cooked weight)

| | | | | | |
|---|---|---|---|---|---|
| Idiappam | 30 g | 1 No. | Pineapple | 90g | 1.5 round slices |
| Baji | 15 g | 2 Nos. | Tomato | 240g | 4 medium |
| | | | Watermelon | 175 | ¼ small |
| Chutney (coconut Ground nut and coriander) | 20g | 1 tbsp | Tea | 50ml | 1 cup |
| | | | Freshlime juice | 200 ml | 1 glass |
| Tomato chutney | 500g | 5 tbsp | Papad (fried) | | 1 No. |
| Boiled egg | 30g | 1.5 Nos. | Papad (grilled) | | 2 Nos. |
| Jam | 20g | 3 tsp. | Pickle | | 1 tbsp. |
| Apple | 75g | 1 No. | | | |
| Banana | 30 g | ¼ medium | | | |
| Dates | 30g | 3 Nos. | | | |
| Grapes | 105g | 20 Nos. | | | |
| Guava | 100g | 1 medium | | | |
| Mango | 10g | 1 small | | | |
| Orange | 90 g | 1 small | | | |
| Papaya | 120g | 2 medium | | | |

12. Foods providing 100 KCals. - 150 ml

| Food items | Quantity | Volume |
|---|---|---|
| Boiled rice | 100g | 1 k* |
| Dosa | 35 g | ¾ Nos. |
| Puri | 30 g | 1½ Nos. |
| Sambar | 120 g | ¾ k |
| Avial | 90 g | 1 k |
| Potato Bonda | 40 g | 1 Nos. |
| Sogo vada | 30g | 1 Nos. |
| .Vet.cutlet | 50 g | 1½ Nos. |
| Sundal | 130g | ¾ k |
| Idli | 100g | 1½ Nos. |
| Bread | 40g | 2 slices |
| Kadala curry | 95 g | ¾k |
| Sandwich | 33 g | 1 Nos. |
| Rajmah curry | 100g | ¾ k |
| Greengram boiled | 150 g | 1k |
| Buttermilk | 750 ml | 7 cup |
| Curd | 210 g | 1 cup |
| Milk cow | 108 ml | 1 cup |
| Milk skimmed | 260 ml | 1¼ cup |
| Skimmed milk powder | 30g | 2 tbsp |
| Roasted grounnut | 20g | 60 Nos. |
| Cashewnut | 20 g | 50 Nos. |
| Coffee | 150 ML | 1 Cup |
| Squash | 200 ml | 1 glass |
| Oats | | 1/3 cup |
| Cornflakes | | 1 cup |
| Toned milk | | 1 cup |

* k stands for katorie

13. Food providing 150 kcals

| | | |
|---|---|---|
| Paratha | 50 g | 1 Nos. |
| Chapathi | 30g | 1¼ Nos. |
| Sevian Upma | 100g | 1¼ Nos. |
| Bread toasted | 45 g | 1¾ slice |
| Oklaub dak | 125 g | ¾ k |
| Veg,gravy | 150 g | 1¼k |
| Curd vada | 80g | 1Nos. |
| Omlet | 60 g | 1 Nos.. |
| Veg.puff | 50g | 1 Nos. |
| Carbonated beverages | 200ml | 1 bottle |

k stands for kaborie

14. Foods providing 200 kcals

| | | |
|---|---|---|
| Masala dosa | 100g | 1Nos |
| Upma (Reva) | 130 g | 1 k |
| Rice flakes upma | 100 g | 1 k |
| Samosa | 65 g | 1 No. |
| Fish (fried) | 85g | 2 Pieces |
| Biscuits | 40 g | 2 Nos. |
| Cake | 40 g | 1 |
| Vegetable puff | 80 g | 1½. Nos. |
| Pudding | 120 g | 1 k |

k stands for kalorie

## APPENDIX - 4

**General Information**

I. Name of the respondent :

II. Age : III. Sex :

IV. Address :

A. Socio-economic profile

V. Type of family :

No. Of family members

Adults: M F

Children:

VI.

| Member | Educational status | Occupation |
|---|---|---|
| Wife | | |
| Husband | | |
| Son | | |
| Daughter | | |

VII. Economic status:-

Monthly income (Rs.) :

VIII. Source of monthly income :

IX. Monthly expenditure on

(1) Food :

(2) Health care :

Blood lipid profile

Total cholesterol HDL

Triglyceride LDL

VLDL

B. Dietary pattern

I. Food habit:-

II. Are you following any special diet? : Yes/No

III. Frequency of taking meals/day :

IV. Frequency of use of various food items by the respondent

| Food item | Prequency | | Approximate quantity |
|---|---|---|---|
| | Week | Day | |
| Cereals | | | |
| Pulses | | | |
| Leafy vegetables | | | |
| Roots and tubers | | | |
| Other vegetables | | | |
| Fruits | | | |
| Milk | | | |
| Milk products | | | |
| Meat | | | |
| Egg | | | |
| Fish | | | |
| Nuts and oil seeds | | | |
| Oil | | | |
| Sugar | | | |
| Processed foods | | | |
| Confectionary | | | |
| Beverages | | | |

How many cups of tea/coffee do you take a day. Do you take sugar? Yes/No
If yes, how much? _____ tsp

V. Qty. of oil used/month : (kg)

## C. Life style

I. Frequency of alcohol consumption:-
II. Type of alcohol taken:-
III. Qty. Of alcohol taken:-
If you do not drink alcohol now, have you ever took alcoholic drinks before: Yes/No
How many years back?
IV. Particulars about smoking.
How many per day?
If you do not smoke now, have you ever smoked before? Yes/No
How many years back
V. Do you have the habit of doing exercise?
If yes, specify time _____ duration _____

VI. Type of exercise

VII. How many hours do you spent on:-

1. Sleep
2. Mental work
3. Recreation
4. Relaxation

VIII. Do you have any stress and strain in your day to day life? Yes/No

If yes, type _____

IX. Do you feel anxiety for anything?

If yes, specify _____

## APPENDIX 5

Checklist to find out the rate of adoption of reversal diet among the respondents

| | Adopted | Not adopted |
|---|---|---|
| 1. | Restricting the use of fat in the daily diet | |
| 2. | Avoiding cholesterol-rich foods like meat and egg | |
| 3. | Inclusion of fish thrice a week to increase omega-3-fatty acid content of the diet | |
| 4. | Use of skim milk insted of whole milk | |
| 5. | Inclusion of fresh salads in the daily diet | |
| 6. | Use of whole, unrefined cereals and pulses | |
| 7. | Avoiding stimulants like alcoholic beverages, cola, coffee etc. | |
| 8. | Moderate use of salt and sugar | |
| 9. | Regular and brisk walking for one hour | |
| 10. | Taking five moderate meals instead of three heavy meals | |

## APPENDIX 6

Read the sentences given below and specify whether you agree or disagree:-

| | Agree | Disagree |
|---|---|---|
| 1. | Heart disease is a problem seen in European countries only. | |
| 2. | Heart diseases affect men only. | |
| 3. | Improper diets increase genetic tendencies towards heart disease. | |
| 4. | Inadequate and improper diets contribute to different types of diseases. | |
| 5. | There is a strong connection between dietary habits and cardiac disease. | |
| 6. | Diet has nothing to do in the management of cardiac diseases. | |
| 7. | Increased level of blood lipids are the major risk factors for heart disease. | |
| 8. | Diet has an important role in maintaining the normal level of blood lipids. | |
| 9. | A zero fat diet is excellent. | |
| 10. | Only cholesterol containing foods cause heart disease. | |
| 11. | Before cooking, remove all fat from meat. | |
| 12. | For a healthy heart, use oils with saturated fat. | |
| 13. | 'LDL' in blood is known as 'good cholesterol'. | |
| 14. | High level of 'HDL' in blood is responsible for heart diseases. | |
| 15. | Foods rich in antioxidants are good for health. | |

| | Agree | Disagree |
|---|---|---|
| 16. Fast foods and canned foods are good for health. | | |
| 17. Include salads in your diet daily. | | |
| 18. Yellow, orange and green vegetables and fruits add life to the heart. | | |
| 19. Fried foods are desirable compared to steamed foods. | | |
| 20. Vegetable oils can be used in plenty. | | |
| 21. It is good to use mixed oil instead of a single oil. | | |
| 22. Repeated heating of oils must be avoided. | | |
| 23. Salt can be used as much as one likes. | | |
| 24. Increased intake of salt leads to increased blood pressure. | | |
| 25. For a healthy heart, tea is better compared to coffee. | | |
| 26. Carbonated beverages and those containing caffeine must be completely avoided. | | |
| 27. Alcohol does not increase 'good cholesterol'. | | |
| 28. Smoking is a major factor leading to heart disease. | | |
| 29. Smoking decreases clot formation in arteries. | | |
| 30. Stress and strain increases the risk of developing heart disease. | | |
| 31. Worries, tension and anxiety increase the life expectancy. | | |
| 32. Sedentary habits increase the energy expenditure. | | |
| 33. Excercise increases 'good cholesterol'. | | |
| 34. Only vigorous exercises are good for health. | | |

| | Agree | Disagree |
|---|---|---|
| 35. A long brisk walk is considered desirable to increase 'HDL' level in blood. | | |
| 36. Always try to maintain an ideal body weight as a precaution against diseases. | | |
| 37. Obesity decides the level of cholesterol and triglycerides in blood. | | |
| 38. Fat around the abdomen is dangerous that fat around the hips. | | |
| 39. It is not desirable to starve or over-eat. | | |
| 40. One meal a day is good for reducing body weight. | | |
| 41. The higher the body weight, the greater the risk of developing heart diseases. | | |
| 42. Diabetes, hypertension (high B.P.) and obesity increases the level of blood cholesterol. | | |
| 43. The prevalence of heart disease is lower in diabetics. | | |
| 44. Insulin does not favour fat deposition. | | |
| 45. As age advances, eat more and do less work. | | |
| 46. The arteries become broad as age advances. | | |
| 47. Dinner must be the heaviest meal of the day. | | |
| 48. Have dinner atleast two hours before you go to bed. | | |
| 49. Heart patients must not practice 'Yoga'. | | |
| 50. Meditation can do a lot in the management of heart diseases. | | |

# ABSTRACT

# STANDARDISATION OF REVERSAL DIETS FOR CARDIAC PATIENTS

By

**SOUMYA I.G.**

***ABSTRACT OF THE THESIS***

*Submitted in partial fulfilment of*
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**Department of Home Science**
**COLLEGE OF AGRICULTURE**
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## ABSTRACT

The present study on "**Standardisation of reversal diets for cardiac patients**" was undertaken with an objective to standardise reversal diets which suited Kerala conditions, and to assess its impact on the blood lipid profile of selected cardiac patients through diet counselling. Based on the principles of reversal diet and traditional recipes of Kerala, modified diets low in fat, high in fibre, moderate salt and sugar, without any stimulants and fleshy foods were planned.

A seven day's menu was formulated by modifying the normal diets of Kerala to meet the needs of cardiac patients with reference to nutritional requirement and variety. Three types of menu (1000 Kcal., 1250 Kcal. and 1500 Kcal.) were planned on the basis of total calorie requirement. Each recipe selected under the seven day's menu was worked out with respect to the quantity of raw ingredients, salt and fat added and the major cooking method adopted.

A ready-reckoner was formulated which explained in detail the quantity of raw ingredients, method of cooking as well as the cooked volume of the product. The nutritive value of the planned diet was computed with the aid of food composition table.

Inorder to conduct a general counselling, a data-base survey was carried out at Medical College Hospital - Thiruvananthapuram, Al-Arif Hospital - Ambalathara and P.R.S. Hospital - Killippalam. Details regarding the socio-economic, dietary, blood lipid profile and lifestyle pattern were collected from 150 patients and they were given general counselling.

The awareness about dietary modifications of cardiac disease as well as the rate of adoption were measured using suitably structured schedule. From among the 150 respondents, 30 subjects were selected who satisfied the inclusion criteria such as willingness to participate, higher adoption rate, uniform medication and severity of the disease. They were subjected to intensive diet counselling.

Intensive diet counselling was conducted for the patients along with their spouses. Diets chart and booklet on 'Diet and Heart Disease' were distributed to them along with the Ready Reckoner. The respondents were advised to follow the modified diet for a period of three months. The initial and final blood lipid profile (TC, TG, HDL, LDL and VLDL) of these respondents were estimated using standard techniques.

Results indicated that there was significant difference between the initial and final blood lipid values along with gain in knowledge and increased rate of adoption. This reveals the positive impact of reversal diet in the effective management of cardiac diseases.