Formulating And Testing Diets Suitable For Cardiovascular Patients

By

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A THESIS SUBMITTED TO THE AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN - DEEMED UNIVERSITY, COIMBATORE - 641 043

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN

FAMILY AND COMMUNITY SCIENCE

APRIL - 1999

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April - 1999

Certified As Bonafide Research Work

Signature of the Head of the Department.	Signature of the Dean of the Faculty.	Signature of the Guide.

Acknowledgement

ACKNOWLEDGEMENT

The investigator is grateful to Padmashree **Dr. (Tmt) Rajammal P . Devadas, M.A., M.Sc., Ph . D.,** (Ohio State), D.Sc . (Madras), Chancellor of Avinashilingam Institute For Home Science and Higher Education For Women (Deemed University), Coimbatore for providing the opportunity to conduct the study .

Her Sincere thanks to **Dr . (Tmt) Lakshmi Santa Rajagopal M.Sc.,** (Tennesse) , Ph. D., (Madras) , Vice Chancellor of Avinashilingam Institute For Home Science and Higher Education for Women (Deemed University), Coimbatore and to **Dr . (Tmt) Parvathy Easwaran , M.S.** (Columbia) Ph.D., (Madras), Dean , Faculty Of Home Science , for their help given during the study .

Her grateful thanks to **Tmt . Saroja Prabhakaran** M. A., Dip in Ed ., (Madras) Ph . D., (Mother Teresa), Registrar and Director , Hall of residence , for extending all the help and guidance for the smooth conduct of the study and to **Dr . (Tmt) Vijayalakshmi Purushothaman** , M.Sc., Ph. D., (Madras) , Professor and Head of the Department of Family and Community Science for her critical criticism and able guidance throughout the study .

The investigator expresses her deep sence of gratitude and Sincere thanks to **(Tmt) A .Thirumani Devi** , M . Sc., (Madras) M . Phil ., (Coimbatore), Lecturer , Department of Family and Community Science , for her Critical discussion , stimulating suggestions and valuable guidance throughout the study .

The author is deeply grateful to **Dietetians** , Dietary Departments of Krithika Diabetic Hospital , (Salem) , KG Hospital , Kuppuswamy Naidu Hospital and KMCH Hospital , (Coimbatore) for their co - operation and valuable suggestions .

The author is extremely grateful to subjects **Thiru . Ramasami** , **Tmt . Santhanalakshmi** and **Tmt . Sarojini** for their co - operation and concrete help throughout the experimental period , by following the formulated diets carefully .

She wishes to record her sincere gratitude to her Beloved Parents , husband , other family members and friends for extending their support and encouragement without which the study would never have seen the light of the day . Above all she thanks God almighty.

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Introduction

INTRODUCTION

Live life to the full , we must be fit and energetic and enjoy living. Many things help to make us feel like this. The most important is , eating the right foods for health and enjoyment.

- Anne Barnett.

Cardiovascular disease is an universal health problem responsible for majority of deaths in many countries. This disease has no geographic and racial boundaries and occur throughout the world , in all races and in all strata of society , though variations between sexes , ages and socioeconomic status do exist. Since they are often fatal , biomedical research all over the world is directly focussing towards prevention of heart disease at an early stage.

Cardiovascular diseases , are responsible for major disability in both the developed and developing countries. It has been predicted that by A.D. 2020 upto three quarters of deaths in developing countries would result from non - communicable diseases and that coronary heart disease will top the list of killers (WHO ,1998).

Cardiovascular disease is a major health problem in many developing countries like India and , is more prevalent in urban than in rural areas. Epidemiological surveys indicate that there could be 15 - 20 million cases of coronary heart disease in India (JIMA ,1998). According to chada et al., (1994) in India , over all incidence rate of cardiovascular disease was 19.7 / 1000 in urban areas when compared to 9.2 / 1000 in rural areas.

Cardiovascular disease is a condition of chronic Hyper cholestero - lemia , a high cholesterol level in the blood (240 mg/dl), is considered as a risk factor in heart disease , accompanied sometimes by complications like obesity , diabetes mellitus , hypertension and act persons of all age groups , but common between 45 to 55 years of age (Guthrie , 1989).

According to Victor and Schaefer (1993) serum cholesterol due to increased LDL cholesterol increasing age among males , females after menopause , HDL - cholesterol levels less than 35 mg/dl , hypertension , diabetes mellitus , history of premature coronary heart disease , obesity , cigarettee smoking , excessive alcohol consumption , sedentary life styles and high habitual dietary intake of total fat and saturated fat are major risk factors for the development of cardiovascular disease.

According to Boston et al.,(1996) the diet – heart hypothesis proposes that elevated intake of total fat , saturated fat and dietary cholesterol increase serum cholesterol which in turn increase the risk of developing cardiovascular diseases.

A cardiovascular patient can eat almost any food that other people normally eat , provided the food is balanced and within the permissible fat limits. The daily requirement of fat should be well distributed between different meals (Delhi ,1990). But dietary recommendations to prevent cardiovascular disease involve reducing weight , limiting fats to 30 percent or less of all kilocalories , maintaining an optimal ratio between polyunsaturated fatty acids mono – saturated fats and saturated fats (Williams , 1991).

It is widely documented that a diet rich in saturated fatty acids is atherogenic and is associated with increased plasma cholesterol and low density lipoprotein levels (Keys , 1990 and AHA nutrition Committee , 1992).

Cardiovascular diseases in India can be prevented by controlling intake of calories , saturated fats , salt , alcohol and tobacco , by increasing both work - related and leisure - time physical activity , increasing consumption of "heart – healthy" foods such as fruits and vegetables , high fibre cereals , oil containing balanced amounts of PUFA and monounsaturated fats , and spices and cereals with high flavonoid content (Nair and Nagar , 1997).

Wolfram (1996) states that primary prevention of atherosclerosis by taking a low fat diet is very important since cardiovascular disease is the major determinant of premature death. Long - term high intakes of many vegetable oils or long chain n-3 polyunsaturated fatty acids , reduce the risk of cardiovascular diseases (Ghafoorunissa , 1998).

The philosophy of meal plan for cardiovascular patient to achieve good health care is based on the following guidelines. A. attain and maintain a reasonable weight b. avoid over eating (which puts extra fat on the body) c. include food that are easy to eat and digest and exclude more fat d. limit sodium especially with hypertension and edema e. divide food intake into several small meals instead of 2 or 3 large ones and f. make meal times pleasant (Aronson , 1990).

Health care now-a-days include the concept of continuity of care to implement the continuity of care , with respect to need to patient require counselling for proper choice of food and preparation depending upon their restriction along with their family members. The effectiveness of health care depends greatly on the patients ability to manage his own diet (Shigeta , 1991).

According to Chetty (1997) the lack of awareness on the part of the patients especially cardiovascular patients , diabetes etc. about the quantity and quality of food to be consumed aggravated their condition , While the common man must be provided adequate information as to how his nutritional needs ,can be fully met through the judicious use of foods available at his own doorstep , the affluent sections need to be informed of the deleterious effects of dietary excesses and errors and as to how these can be avoided. We one , today carrying the double burden of nutritional problems among the poor sections of the population of the one hand and such problems as over weight and obesity among the affluent sections attributable to wrong diets and unhealthy life styles , on the other. Hence the dietary guidelines are important to the common man in order to enable him to make the right choice of foods available to him , for ensuring optimal health and freedom from disease for his family.

Formulation of such dietary guidelines would ensure nutritional adequacy of the populations and they could be directly applied for general population or specific physiological or high risk groups to desire health benefits. Dietitians , nutritionists , medical and health personnels responsible for diet counselling require more detailed information about the nutrient content of foods for formulating diets suitable for various disease conditions.

They can use some diet guidelines which can emphasize promotion of health and prevention of disease conditions.

In general , public is also interested in knowing the nutrient content of cooked food preparations they eat and to plan a suitable diet which help them to attain and maintain normal weight and to control disease conditions.

By keeping all these points in mind , the investigator was interested in conducting this study on " Formulating and Testing Diets Suitable for Cardiovascular Patients " with the following aims and objectives:

1. To formulate diets suitable for cardiovascular patient
2. To calculate and analyse the nutrient content of the formulated diet
3. To develop a ready reckoner table to show the nutrient content of the formulated diets and
4. To test the effect of formulated diets on blood cholesterol level of the selected cardiovascular patients.

Review of Literature

REVIEW OF LITERATURE

The review of literature pertaining to this study is viewed under the following headings:

1. Cardiovascular disease as an universal health problem
2. Preventive and therapeutic role of diet in cardiovascular disease
3. Calculation and analysis of nutrient content of the food items used in the formulated diets suitable for cardiovascular patients and
4. Impact of fats and oils on blood cholesterol level of cardiovascular patients.

1. Cardiovascular disease as an universal health problem

The disease of the heart (cardio) and blood vessels (vascular) is the number one killer in the world. It claims more liver than all other causes of death. It is a stealthy killer that develops slowly and without noticeable symptoms over a number of years (Park , 1997).

According to Kuller et al., (1994) data from cardiovascular health study indicates that 36.1 percent women and 38.7 percent of the men in America had subclinical atherosclerosis and cardiovascular disease and that the prevalence increased with age.

Greenberg et al., (1992) estimate that more than million people , one in four in the U.S.suffers from some form of these disease and almost one in two Americans eventually die of CVD , one every 32 seconds. One in five men and one in 17 women die of a heart attack prior to the age of 60.

Shills (1994) states that cardiovascular disease accounted to nearly one million deaths in U.S., almost half of the total deaths with 18 percent of these deaths occuring in patients under 65 years of age. About 1.5 Americans undergo cardiovascular operations , 1.5 Americans experience a heart attack and 2.18 Americans suffer from rheumatic heart disease

According to Romeio (1996) in mexico , the incidence and prevalence of coronary heart disease has increased over the part three decades and has become the leading cause of death in the country.

Cardiovascular diseases causes 25 – 30 percent of deaths in most industrialized countries. Cardiovascular diseases is held responsible for about 30 percent of deaths in men and 25 percent of deaths in women in most western countries (Park , 1997).

Cardiovascular disease can no longer be considered a problem of only affluent countries. Rapid industrialization , socio economic development and increase in life expectancy , the stage is now set for chornic disease in India. In recent years , there has been a significant change in life style and dietary patterns with growing affluence (Reddy , 1998)

Cardiovascular disease have become number one killer in western countries but rank third in India (Peter , 1993) . Cardiovascular disease and cancer account for two third of all deaths (John , 1994).

In India , over all incidence rate of cardiovascular disease was 19.7/1000 in urban areas when compared to 9.2/1000 in rural areas (Chada et al., 1994). studies done in India suggest that the prevalence of coronary artery disease is about 16 percent (Mehta and Cardiol , 1995). The incidence in urban population ranges from 31.5 to 65.4 per 1000 in males and 25.3 to 47.8 per 1000 in females (Trenan and Misra , 1996).

India , is racing towards the high risk zone and cardiovascular is identified as a major contributor to mortality and morbidity in the country. Conservative estimates suggest that in 1990 cardiovascular disease caused 2.38 million deaths and the nation incurred a loss of 28.59 million stability adjusted life years (Bray , 1992).

Ghafoorunissa and Krishnaswamy (1996) warn that urban Indians are manifesting a traditional risk profile and if the trend persists , it is feared that they will soon replicate the experience of Indian migrants. Rural Indians also go the same way subject to alteration in life style as a result of urbanisation or esterization.

2. Preventive and therapeutic role of diet in cardiovascular disease

"Appropriate food choices right from an early age can prevent , delay or decrease premature disability and death".

The goals of nutrition intervention of dietary treatment in heart disease are to reduce the rise of disease , to prevent morbidity and mortality. Individuals potentially can alter their diet to reduce the risk of development of coronary heart disease.

Diet has an important role in maintaining an ideal body weight , body fat and normal levels of blood lipids. Increased body weight and blood lipids and the development of artheroschlerosis and thrombosis , are in - fact the end results of prolonged faulty dietary habits. Improper dietary practices can also trigger underlying genetic tendencies towards artherosclerosis and thrombosis. By adopting a prudent diet one can reduce the extent and severity of risks which promote injury and fat deposition (Ghafoorunissa and Krishnaswamy,1996).

Intosh et al., (1991) opined that several dietary factors are known to influence plasma cholesterol concentration , like diet cholesterol , fat and on account of dietary fat.

Results of the study by Pattilo and Krisetherton (1992) indicate that weight reduction through dieting is a viable approach to help to normalized plasma lipids and lipoprotein in overweight individuals.

According to Hara (1992) substitution of saturated fat by complex carbohydrate resulted in decreasing cholesterol and suggested that decreasing dietary satuated fat cause alteration in LDL composition that resulted in increased receptor clearance.

Bakhit et al., (1994) research findings revealed that consumption of soyabean protein of 25 g daily is associated with lowering of total serum cholesterol concentration in individuals with initial cholesterol values more than 5.7 m.mol / lit.

According to Truswell (1994) an increase in dietary energy from carbohydrate is usually associated with moderate increase in fasting plasma triglyceride level.

Incorporation of fibre in the diet brings about reduction in serum cholesterol by preventing its absorption. Twenty seven percent of total energy from fat, 59 percent carbohydrate and 55 g of dietary fibre / 2500 kcal produce the most favourable lipid profile (SriLakshmi , 1993).

Anderson et al., (1992) pointed that high fibre intake help to prevent or to treat , cardiovascular disease hyperlipidemia , obesity , hypertension , certain cancer , gastro - intestinal disorder and diabetes.

According to Adhikari (1992) , good health can be acquired , sustained , restored and conserved by proper food which plays an active , significant , powerful and decisive role as far as the health is concerned.

It is therefore important to concentrate on factors which can reduce the risk of developing heart disease. Results of several large scale studies showed that certain strategies based on dietary modification , if implemented , can decrease the morbidity associated with the diseases of heart and blood vessels and bring about a regression of the pathological process. A high cholesterol level is not good for health. High cholesterol levels need not produce any symptom. When cholesterol rises above a particular level , it increases the risk of heart attacks , strokes and other CVD. Understanding the problem of high cholesterol and adopting ways to control , it may help to lead a longest and healthier life (Mohan 1991).

3. Calculation and analysis of nutrient content of food items used in the Formulated diets suitable for cardiovascular patients

Food and nutrient analysis is a important branch of Food Science and Technology and providing information on the quality and nutritional value of foods. New techniques are prevailing greater insight into the nature and composition of foods and development in instrumentation and providing the means for rapid and economical analysis (Joshi , 1992).

A knowledge of nutritive value of foods commonly consumed by the community help in the understanding of the relationship between the intake of food and the incidence of malnutrition (Devadas , 1994).

Macrae et al., (1993) opined that reliable and valid food analysis depends on efficient laboratory operation , suitable reagents , fully calibrated and maintained equipments and instruments and effective sampling and sample preparations.

One of the primary goals in analysis of foods for their nutrient content is the description of the nutrient content of the foods that are encountered in real world (Rand , 1992).

Chemical analysis of food enables one to obtain useful data regarding the approximate content of nutrients such as carbohydrates , fats, proteins , minerals , vitamins and water in any given foods.

In the process of cooking , many chemical changes like oxidation , maillard browning , cross linking of proteins , etc occurs. Rate and extend of chemical changes depends on time , temperature , pH and concentrations of reactive constituents. Not only there is a loss of nutritive quality , also changes in color and potential production of toxic constituents and loss of vitamins and amino acids (Gabrielewagner and Guilbault , 1993).

During cooking vitamin -C gets easily oxidised , in addition to dissolving in washing and cooking water , exposure of cut leafy vegetables to air before cooking or serving , results in loss of a part of vitamin – C. The average cooking or processing losses range from 30 – 40 percent (Sethi and Malhan , 1993).

4. Impact of fats and oils on blood cholesterol level of cardiovascular patients

Lipids have many nutritional and physiological roles. Several of these that are related to the maintenance of health continually re-emerge as if they were new problems. Based on our knowledge of nutritional value , physiological functions and metabolic pathways , fats can be assigned its appropriate role in the diet. It is not the perfect food nor should it be removed from the diet entirely. Rather as in all ways moderation should be the guide to maintain health status.

It appears that diets rich in saturated fats leads to higher cholesterol levels in the blood and that diets lower in saturated fats and higher in unsaturated fats can reduce the serum cholesterol (Herriott , 1993).

Diet rich in saturated fatty acids is atherogenic and is associated with increased plasma cholesterol and LDL levels (Keys , 1990 and AHA Nutrition Committee , 1992).

The data from both dietary and plasma fatty acids showed that while the requirements of linoleic acid (18:2 n- 6 , LA) were fully met due to their high levels in cereals and many vegetable oils , α - linolenic acid (18 : 3 , n - 3 ALNA) intakes were low. Long - term high intakes of ALNA or long chain n - 3 PUFA (LCn–3 PUFA) reduce the risk of heart diseases (Chakrabarty , 1998).

Metabolic studies conducted in Indian subjects to investigate the effects of using long chain n-3 PUFA (ALNA) (Fish , Mustard oil) in comparison to oils having negligible long chain n - 3 PUFA (Groundnut oil , Palm oil) on plasma lipids and essential fatty acid status showed that at a level at a energy percent LA , about 0.2 to 0.5 energy percent Lc n – 3 PUFA or 1.4 energy percent ALNA produced anti –atherogenic effects (ICMR , 1998).

Methodology

METHODOLOGY

The Methodology related to the conduct of the study on "Formulating and Testing diets suitable for Cardiovascular patients " is given under the following headings:

1. Selection of the venue
2. Formulating diets suitable for cardiovascular patients
3. Calculation and analysis of the selected nutrient content of the formulated diets
4. Developing the ready reckoner for the formulated diets suitable for Cardiovascular patients
5. Testing the effect of formulated diets on blood cholesterol level of the selected cardiovascular patients and
6. Analysis of the data

1. Selection of the venue

Foods and Nutrition laboratories of Avinashilingam Deemed university were selected as the venue for conducting the research work because of the convenience and facilities available for the preparation of diets and analysis of the selected nutrient content of the formulated diets.

For testing the effect of formulated diets on blood cholesterol level cardiovascular patients were selected from Krithika Hospital in Salem, Town , since the investigator belongs to Salem Town. The authorities and cardiologists in that hospital were interested in the research work related to dietary management of cardiovascular disorders. They also assured co-operation and help for the conduct of the study.

2. Formulating diets suitable for cardiovascular patients

According to Ghafoorunisa and Krishnaswamy (1996) the proper diet is the key to good health and Vigour. Diet and nutrition are synonymous with health. Inadequate and improper diet contribute to several chronic degenerative diseases such as cardiovascular disease, diabetes and cancer. Sensible and healthy food habits right from childhood coupled with good life style can, not only delay ageing and increases the life span but also adds to the quality of life. Though the faulty dietary practices are implicated in chronic diseases, it is essential to remember that the foods we eat and healthy dietary practices are the corner stones of good health and vitality.

The general plan for the patient with cardiovascular disease is based on the following objectives. 1. calories should be sufficient to maintain appropriate body weight for a given height. 2. total fat intake should be between 20-30 g (visible + invisible) or 20 percent of total calories. 3. protein should provide around 35 g to 15 percent of total calories. 4. salt intake should be between 5 - 7 g/day and 5.Dietary fibre should be around 40g/day (NIN, 1998).

According to Boston et al., (1996) the diet - heart hypothesis proposes that elevated intake of total fat, saturated fat and dietary cholesterol increase serum cholesterol which in turn increase the risk of developing cardiovascular disease. Long term high intake of mixture of vegetable oil combinations, α - linolenic acid (18:3, n - 3 ALNA) or long chain n - 3 polyunsaturated fatty acid (Lcn - 3 PUFA) reduce the risk of coronary heart disease (Ghafoorunissa, 1998).

Keeping these points in mind , diet for cardiovascular patients was formulated by using different vegetable oil combinations suggested by Ghafoorunissa (1998). The different oil combinations used for the preparation of formulated diets were (1). sunflower oil : Palmoil : mustard oil in the ratio of 2:1:1; (2) Groundnut oil : mustard oil in the ratio of 3:1; (3) sunflower oil : palm oil in the ratio of 1:1 and (4) soyabean oil : groundnut oil in the ratio of 1:2. The total amount of oils used in each days food preparation is 25 grams 1800 kcal diets were formulated for seven days and were given for expert opinions of various dietitians of well known hospitals such as Krithika Hospital in Salem ; KMCH , KG and Kuppusamy Naidu Hospital in Coimbatore. Their views were considered for further modification in the formulated seven days diets.

1800 Kcal diets were prepared for seven days by using four different vegetable oil combinations. The quantity and quality of raw food ingredients, nutrient content and their preparations are elaborately discussed in Results and Discussion.

1800 Kcal diets were prepared by using four different vegetable oil combinations. Each part of the menu was evaluated for its acceptability by sensory methods by the team of 10 P.G. students. The diet which obtained the highest acceptability score through the evaluation was used for the further indepth study.

3. Calculation and analysis of the selected nutrient content of the formulated diets

Energy , protein and fat should be in proper proportion to meet the cardiovascular patients needs , which in turn prevents cardiovascular disease. (Whitney , 1997).

Selected nutrients like energy , protein , fat , fiber and vitamin - C were calculated for all the raw ingredients used in the preparation of formulated diets by using the Nutritive value of Indian foods (1996) of NIN , Hyderabad.

Formulated diets were analysed quantitatively by using appropriate and standard analytical procedure followed by NIN Laboratory Manual (1983) for nutrients like energy , protein , fat , fibre and vitamin - C. Ten percent of the cooked sample menu was used for analysis purposes.

1. Calorific value by using bomb calorimeter
2. Protein by macro kjeldahl method
3. Fat by solvent extraction method using soxhlets apparatus
4. Fibre by Extraction method
5. Vitamin – C by Dye method.

All the above nutrients were analysed carefully till concordent values were obtained. This helps to minimize errors and to get perfect results.

4. Formulation of Ready Reckoner for the seven days sample diets suitable for cardiovascular patients

Food and nutrient table serve as an effective and very useful nutritive education tool (Marcrelic , 1994).

Ready reckoner tables were prepared for the formulated 1800 kcal sample diets for the period of 7 days. This table also give detailed information regarding the total weight of cooked foods in 1200 1800 and 2100 kcal diets and their nutrient content such as calories , protein , fat , fibre and vitamin – C.

Ready reckoner developed for cardiovascular patients is useful in hospitals , dietitians , food service industries , educational and other organization and even by common educated person for promoting and maintaining healthy and joyful living.

5. Testing the effect of formulated diets on blood cholesterol level of selected cardiovascular patients

For collecting the background information , an interview schedule was used. According to Gupta , (1993) interview is an unique method which involves the collection of data through direct verbal interaction between the interviewee and interviewer. Interview schedule used for collecting background information was given in Appendix - I.

The interview schedule evolved contained information on the family history of subjects , family composition , socio economic status , consumption of selected foods , pattern of oil consumption , consumption of fleshy foods , fibre foods , signs and symptoms of the diseases , physical activity pattern and their present medical treatment.

Data on the blood cholesterol level , body weight and Body mass Index of the selected patients were recorded before and after the experimental period of 30 days. The selected three patients were advised through proper dietary counselling , by the investigator and dietitians to follow the formulated diets and test the effect of the formulated seven diets on blood cholesterol level strictly. Daily 25 g of vegetable oil in the combination of soyabean oil and groundnut oil (2:1) was given by the dietitian to each of the three patients for the entire day food preparations for the period of 30 days.

Checking was a part of the study to make sure that the formulated diets were prepared by using the 25 g of vegetable oil and consumed by the patients regularly.

The patients on oral hypocholesterolemic drugs were allowed to continue during the experimental period when they followed the formulated diets.

6. Analysis of the data:

The data collected was analysed and interpreted in chapter IV.

Results And Discussion

RESULTS AND DISCUSSION

The Results and Discussion of this study on " Formulating and testing diets suitable for cardiovascular patients " are given under the following headings.

(1) Formulating diets suitable for cardiovascular patients
(2) Calculating and analysing the nutrient contents of the formulated diets
(3) Framing a ready reckoner for the formulated diets suitable for cardiovascular patients and
(4) Testing the effect of formulated diet on blood cholesterol level of the selected cardiovascular patients.

(1) Formulating diets suitable for cardiovascular patients

Diet planning is the first step required in the management of patients with high cholesterol level. The objective of planning diet for cardiovascular diseases are to reduce body weight and control blood cholesterol levels without losing the protective nutrients (NIN , 1998).

Modifying diet does not mean to say good – bye to all favorites. But lot of foods enjoyed before can be modified to fit in with low – cholesterol diet. Ingredients and methods can often be substituted in a way which is hardly detectable to palate (Australian Nutrition Foundation , 1989).

For this study three different calorie diets ie 1200 , 1800 and 2100 Kcal diets for seven days were formulated and were given for expert opinions of various dietitians of well known hospitals such as krithika Hospital of salem , KMCH , K.G. and kuppusamy Naidu hospital in coimbatore. Their Views were considered for further modification in the formulated seven days diets.

Information regarding the quality and quantity of food items used in the preparations of the seven days menu and methods of cooking adopted for the preparation were discussed in the following pages.

A. Quality and quantity of ingredients used in the preparation of seven days menu.

The quantity and quality of foods should not markedly vary from the normal diets. For this purpose , a food exchange system is used to select a variety of foods that are adequate in nutrients content and satisfying requirements of even disease people (ICMR , 1996)

The protective foods such as vegetable , green leafy vegetable , high fibrous foods were included in liberal amount for the seven days diet preparation. Some of the high calorie food items like fats , nuts , oil seeds , Refined carbohydrate foods and fleshy foods , bottle drinks , hot beverages except tea , pickle , papad etc were used in very limited amount where as whole cereals and cereal products , pulses , roots and tubers are used in moderate amounts.

B. Methods used in cooking

Simple moist heat methods were adopted for the preparation of diets by avoiding frying methods , where fat is used as a medium for transfer of heat. The total amount of vegetable oil combinations used for various food preparation is 25 grams / day.

C. Sample menu formulated for seven days

Formulation of dietary goals and specific guidelines would ensure nutritional adequacy of populations. The dietary guidelines could be directly applied to general population or applied for general population or specific physiological or high – risk groups to derive health benefits. They may also be used by medical and health personal nutritionists and dietitians. (Dietary guidelines for Indians – A manual , 1998).

The sample menu for seven days for cardiovascular patients are given in the following Table – I , weight of raw ingredients used in each days preparation is given in Appendix – II.

Table – I

SAMPLE MENU FORMULATED FOR SEVEN DAYS

First day

Early Morning	Milk (With Soyaflakes)
Breakfast	Idli , Dhal Sambar
Mid Time	Apple
Lunch	Rice , Dhal with Amarnath , Rasam , Butter milk , Vegetable salad.
Tea	HORSE gram Sundal , Tea.

Dinner	Rava uppuma , Bengal gram dhal Chutney
Bed Time	Milk.

Second Day

Early Morning	Milk (With Soyaflakes)
Breakfast	Chapathi , Peas curry
Mid Time	Lemon juice
Lunch	Rice , Phulkas , Vegetable kurma, Palak curry , Tomato Rasam , Buttermilk.
Tea	Green gram Sundal , Tea.
Dinner	Rava Dosai , Vegetable kurma
Bed Time	Milk.

Third Day

Early Morning	Milk (With Soyaflakes)
Breakfast	Wheat Dosai , Coriander chutney
Mid Time	Pine apple.
Lunch	Rice , Brinjal Sambar , Tamarind Rasam , Fenugreek leaves kootu , Beans curry , Buttermilk.
Tea	Bread Sandwich , Tea.
Dinner	Wheat uppuma , onion sambar.
Bed Time	Milk

Fourth Day

Early Morning	Milk (With Soyaflakes)
Breakfast	Ven Pongal , Dhal sambar
Mid Time	Orange

Lunch	Rice , Spinach with dhal , Tomato Rasam , Sundakai puli kulambu , Plantain stem curry , Buttermilk.
Tea	Channa Sundal , Tea.
Dinner	Adai , Mint chutney.
Bed Time	Milk

Fifth Day

Early Morning	Milk (With Soyaflakes)
Breakfast	Phulkas , Dhal masiyal
Mid Time	Apple
Lunch	Vegetable rice , Onion Raita , Amaranth Poriyal , Curd rice ,
Tea	Marie Biscuit , Tea.
Dinner	Idli , Peas sambar
Bed Time	Milk

Sixth Day

Early Morning	Milk
Breakfast	Ragi Dosai , Onion sambar
Mid Time	Orange
Lunch	Rice , Ladies finger Pulikulambu , Tomato Rasam , Carrot kootu , Bottle gourd poriyal , Butter milk.
Tea	Vegetable sand - wich , Tea.
Dinner	Kichidi , Dhal sambar
Bed Time	Milk

Seventh Day

Early Morning	Milk (With Soyaflakes)
Breakfast	Rava Dosai , Channa and Potato Kuruma
Mid Time	Orange
Lunch	Tomato Rice , Onion Raita , Fish curry , Curd rice , Vegetable Salad.
Tea	Marie Biscuit , Tea.
Dinner	Pulkas , Dhal Masiyal
Bed Time	Milk

Since the blood cholesterol level depends mainly on the fat intake, it is essential to have fat modifications. This fat modification that lower blood cholesterol or LDL include substituting mono saturated fats for saturated fats , and substituting saturated fats for PUFA , including vegetable oils and fish oils. The current recommendations for diet , based on these findings (a) eat no more than 30% of calories as fat (b) eat no more than 10% of calories as saturated fat (c) eat no more than 10% of calories from PUFA (d) eat 10 to 15% of calories from monounsaturated fat (e) Limit cholesterol intake to no more than 200 mg daily (Boyle and Zyla , 1992).

Keeping these points in mind , seven days , 1200 , 1800 , 2100 Kcal diets for cardiovascular patients were formulated by using different vegetable oil combinations and amount of oils used in each day's food preparation is 25 grams as suggested by Ghafoorunissa (1998).

Seven day's menu was prepared by using four different oil combinations and each day's menu was evaluated for acceptability by sensory method by the team of ten P.G. Students.

The diet with highest acceptability score obtained through the evaluation was used for further in – depth study. Table – II shows the different vegetable oil combinations and their acceptability scores.

Table - II

Score obtained for SUN : PO : MO* oil (2:1:1) Combinations used in seven days menu preparations

Criteria	7 days Menu Score							Average
	1	2	3	4	5	6	7	Score
Appearance	5	4	4	4	5	5	4	4.4
Colour	4	4	5	5	3	4	4	4.1
Texture	4	4	5	4	4	5	5	4.4
Flavour	3	4	4	4	4	3	5	3.8
Taste	4	5	5	5	4	5	5	4.7
Total								3.0

Maximum score : 7

Maximum score obtained : 3

* SUN - Sunflower oil
  PO - Palm oil
  MO - Mustard oil.

Score obtained for GNO : MO* oil (3:1) Combinations used in seven days menu preparations

Criteria	7 days Menu Score							Average
	1	2	3	4	5	6	7	Score
Appearance	6	5	6	6	6	6	5	5.7
Colour	6	6	5	6	6	6	5	5.7
Texture	5	5	6	6	6	6	5	4.7
Flavour	6	6	6	6	6	5	6	6.7
Taste	6	5	6	6	6	6	5	5.7
Total								4.0

Maximum score : 7

Maximum score obtained : 4

* GNO - Groundnut oil
  MO - Mustard oil

Score obtained for SUN : PO* oil (1:1) Combinations used in seven days menu preparations

Criteria	7 days Menu Score							Average
	1	2	3	4	5	6	7	Score
Appearance	5	4	6	6	4	4	3	4.5
Colour	5	4	6	6	5	6	6	5.4
Texture	6	6	6	6	6	6	6	6.0
Flavour	5	4	4	5	4	4	4	4.2
Taste	5	4	5	4	4	5	4	4.4
Total								3.5

Maximum score : 7
Maximum score obtained : 3.5

* SUN – Sunflower oil
PO – Palm oil

Score obtained for SBO : GNO* oil (1:2) Combinations used in seven days menu preparations

Criteria	7 days Menu Score							Average
	1	2	3	4	5	6	7	Score
Appearance	7	6	6	7	6	6	5	6.1
Colour	6	7	7	7	7	7	6	6.7
Texture	6	6	6	6	6	6	6	6.0
Flavour	6	6	6	6	6	6	6	6.0
Taste	6	6	6	5	6	5	6	5.7
Total								4.5

Maximum score : 7
Maximum score obtained : 4.5

* SBO – Soyabean oil
GNO – Groundnut oil.

The seven days menu preparations with SBD:GRO vegetable oil combinations got the highest score of 4.5. and considered as the highly accepted oil combination for the food preparations. This oil combination was used for further research purpose by using in the food preparation for seven days. and also used for a Calculating and analysing the nutrient content of the formulated diets for seven days.

C. Distribution of nutrients in total calories

The distribution of nutrients in the total calories of 1200 , 1800 , 2100 Kcal is given in the Table.

Score points: 1 – Bad , 2 – poor , 3 – V - Poor , 4 – Fair ,5 – Good,
6 – V – Good, 7 – Excellent

(i) 1200 Kcal Diet:

Low calorie diet helps to reduce body weight and to control blood cholesterol and blood glucose without losing the protective nutrients (Ghafoorunisa and Krishnaswamy , 1996).

a. Amount of foodstuffs used in the preparation of 1200 Kcal diets.

Table II gives a picture on the average amount of food stuffs used in 1200 Kcal diet.

TABLE III

AVERAGE AMOUNT OF FOODSTUFFS USED IN 1200 Kcal DIETS.

Food stuffs	Amount of foodstuffs Used in seven days (g)							Average Amount (g)
	1	2	3	4	5	6	7	
Cereals	286	305	362	362	362	380	343	395
Pulses	88	65	42	114	72	65	38	69
Green leafy vegetables	91	91	99	95	91	91	91	93
Other vegetables	19	19	57	57	19	76	95	49
Roots and Tubers	53	76	53	34	57	53	-	54
Fruits	95	57	95	95	95	95	152	98
Fats and Oil	19	19	19	19	19	19	19	19
Milk and Milk Products	229	229	229	229	229	229	229	229

This seven days sample menu provide 208 g of carbohydrate.56 g of protein and 16 g of fat as on average by distributory 832 Kcal , 224 Kcal and 144 Kcal of energy respectively to the total calorie of 1200 Kcal. The following table gives distribution of nutrients in the total calories.

TABLE IV

DISTRIBUTION OF NUTRIENTS IN THE TOTAL CALORIES - 1200 Kcal

Nutrients	Amounts in g / day							Average Amount (g)	% of Total Calorie
	1	2	3	4	5	6	7		
C H O	200	200	214	214	205	210	210	208	70
Protein	42	62	47	61	56	43	59	56	18
Fat	16	16	16	16	16	16	16	16	12

(ii) 1800 Kcal Diet :

For the patients of ideal body weight , nutrients required to maintain their health are carbohydrate , protein and fat by providing 60 – 65 percent , 15 – 20 percent and 15 – 25 percent respectively of total calories and for diseased person it is always better for a person to maintain the body weight 10 percent lower than the ideal body weight (Raghuram et al 1996).

Amount of foodstuffs used is 1800 Kcal diets and distribution of nutrients in 1800 Kcal diets are given in Table V and VI

TABLE V

AMOUNT OF FOODSTUFFS IN 1800 Kcal DIETS

Food stuffs	Amounts in gm / day							Average Amount (g)
	1	2	3	4	5	6	7	
Cereals	321	343	407	407	407	429	386	444
Pulses	99	73	47	129	81	73	43	77
Green leafy vegetables	103	103	111	107	103	103	103	105
Other vegetables	21	21	64	64	21	86	107	55
Roots and Tubers	60	86	60	39	64	60	-	61
Fruits	107	64	107	107	107	107	171	111
Fats and Oils	21	21	21	21	21	21	21	21
Milk and Milk Products	257	257	257	257	257	257	257	257

This 1800 Kcal diet contains 312 g of carbohydrate , 78.5 g of protein and 24 g of fat as an average amount of seven days , for the distribution of the total 1800 Kcal. Table VI reveals the calorie distribution of 1800 Kcal diet.

TABLE VI

CALORIE DISTRIBUTION OF 1800 Kcal DIETS

Nutrients	Amounts in gm / day							Average Amount (g)	% of total Calorie
	1	2	3	4	5	6	7		
Carbo hydrate	312	312	312	312	312	312	312	312	79
Protein	63.5	91.7	70.8	91.6	84.3	63.7	87.3	78.5	17
Fat	24	24	24	24	24	24	24	24	18

Sample menu formulated for seven days were planned by having different calorie levels – 1200 Kcal , 1800 Kcal and 2100 Kcal. Amount of food stuffs and distribution of nutrients in the total calories of the three diets are given in the following pages. This information is useful in the selection of raw ingredients for the planning and preparation of diets suitable even for disease people.(ICMR , 1998).

(iii) 2100 Kcal diet:

Generally high calorie diet is prescribed for lean person to increase their body weight. The amount of foodstuffs used in each days preparation of 2100 Kcal is given in Table VII and VIII.

TABLE VII

AMOUNT OF FOODSTUFFS USED IN 2100 Kcal Diet

Food stuffs	Amounts in gm / day							Average Amount (g)
	1	2	3	4	5	6	7	
Cereals	375	400	475	475	475	500	450	518
Pulses	115	85	85	150	95	85	50	90
Green leafy vegetables	120	120	130	125	120	120	120	122
Other vegetables	25	25	75	75	25	100	125	64
Roots and Tubers	70	100	70	45	75	70	-	71
Fruits	125	75	125	125	125	125	200	129
Fats and Oils	25	25	25	25	25	25	25	25
Milk and Milk Products	300	300	300	300	300	300	300	300

Total daily intake of calories from carbohydrate , protein and fat in the diet should be carefully distributed and values are given in the following TableVIII

TABLE VIII

CALORIE DISTRIBUTION OF NUTRIENTS IN 2100 KCAL DIET

Nutrients	Amounts in gm / day							Average Amount (g)	% of Total Calorie
	1	2	3	4	5	6	7		
Carbo Hydrate	364	364	364	364	364	364	364	364	70
Protein	74	107	83	107	98	74	102	91.6	17
Fat	28	29	29	29	29	29	30	29	12

(2) Calculating and analysing the nutrient contents of the formulated diets

The most fundamental rule on which a healthful diet can be based is that of using a large proportion of natural food products, and secondly, emphasis should be laid on simplicity in cooking (Puri ,1996). Even though food is carefully chosen for its nutritive value , its nourishment is affected by how food is handled and prepared before it is consumed (Gupta , 1998).

To know about the amount of nutrient present in the cooked foodstuffs and to know about the amount of nutrient loss during the various processes of cooking, the calculated and analytical values were compared and are given in the following paragraphs.

The calculated and analysed values of calorie, protein, fat, fibre and vitamin C of 1200 Kcal, 1800 Kcal and 2100 Kcal diets are given in Table IX - XI

TABLE IX

Calculated and analysed values of calories , protein , fat , fibre and vitamin c of 1200 Kcal diet.

Entire Days Menu	Net Values	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vit – C (mg)
First Day	Calculated	1233.8	42.35	16.09	7.23	57.6
	Analysed	815	28.24	10.7	4.82	32.9
Second Day	Calculated	1232.6	61.33	8.36	9.58	60.78
	Analysed	815	40.6	5.5	6.38	34.6
Third Day	Calculated	1249.9	47.23	6.63	6.26	95.3
	Analysed	831	31.3	4.02	3.50	54.4
Fourth Day	Calculated	1203.5	61.11	7.11	8.72	49.2
	Analysed	802	40.6	4.05	5.5	28.14
Fifth Day	Calculated	1216.6	56.36	6.33	12.82	58.4
	Analysed	809	37.4	4.20	8.01	33.4
Sixth Day	Calculated	1214	42.48	5.28	9.41	9.4
	Analysed	806	28.32	3.38	4.94	5.39
Seventh Day	Calculated	1240	58.26	7.84	9.23	46.36
	Analysed	820	36.84	4.9	6.15	26.49

TABLE X

Calculated and analysed values of calories , protein , fat , fibre and vitamin c of 1800 Kcal diet.

Entire Days Menu	Net Values	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vit – C (mg)
First Day	Calculated	1830.8	63.83	24.15	10.85	86.5
	Analysed	1223	42.36	16.1	7.23	49.42
Second Day	Calculated	1804	92	12.55	14.38	91.17
	Analysed	1223	61.00	8.36	9.58	52.0
Third Day	Calculated	1869	72.85	9.9	9.40	143
	Analysed	1246	47.0	6.03	5.26	81.7
Fourth Day	Calculated	1816	91.67	10.67	13.09	73
	Analysed	1203	61.0	6.08	8.3	42.22
Fifth Day	Calculated	1825	84.36	9.50	19.24	87.69
	Analysed	1214	56.24	6.31	12.02	50.10
Sixth Day	Calculated	1841	68.52	7.92	14.12	14.17
	Analysed	1209	42.48	5.08	7.41	8.09
Seventh Day	Calculated	1845	87.39	27.10	13.85	69.5
	Analysed	1230	55.26	7.4	9.23	39.74

TABLE XI

Calculated and analysed values of calories , protein , fat , fibre and vitamin c of 2100 Kcal diet.

Entire Days Menu	Net Values	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vit – C (mg)
First Day	Calculated	2124.15	74.11	28.17	12.65	100.9
	Analysed	1820	63.54	24.15	10.85	74.14
Second Day	Calculated	2149.6	107.3	14.65	16.77	106.3
	Analysed	1801	92	12.55	14.38	78.1
Third Day	Calculated	2150.5	82.85	11.64	10.96	166.8
	Analysed	1809	70.8	9.96	9.4	122.6 5
Fourth Day	Calculated	2139	108.9	12.5	15.57	86.2
	Analysed	1805	91.67	10.67	13.0	63.34
Fifth Day	Calculated	2150	98.42	11.58	22.44	102.2
	Analysed	1805	74.36	9.47	19.00	75.16
Sixth Day	Calculated	2134.5	74.34	9.24	16.49	16.53
	Analysed	1821	63.72	7.92	11.16	12.14
Seventh Day	Calculated	2152.5	102.95	13.95	16.55	81.14
	Analysed	1875	87.39	11.10	13.85	59.61

(3) Framing a ready reckoner for the formulated diets suitable for cardiovascular patients

Ready reckoner tables were prepared for the formulated 1200, 1800 and 2100 Kcal diets for seven days. This table give detailed information regarding the menu, weight of cooked foods and their nutrient content such as calories, protein, fat, fibre and vitamin - C.

Ready reckoner table developed for cardiovascular patients is useful in hospitals, dietitians, food service industries, educatonal and other organisation and even by common educated person for promoting and maintaining healthy and joyful living.

In order to maintain the health status, it is advisable to have proper dietry planning and adequate knowledge rearding the nutritive value of the foods that are consumed by an individual. Thereby ready reckoner table help them to select adequate diet for the maintenance of their health status.

The ready reckoner tables developed for the formulated diets suitable for cardiovascular patients by using the cooked foods and their nutrient content are given in the following pages.

Table XII

Ready Reckoner for the first day formulated diet

				Analysed Values For Cooked Foods				
Timings	Menu	Calorie diet (Kcal)	Total cooked wt (g)	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vitamin – C (g)
Early Morning	Milk (with Soyaflakes)	1200	42	51	5.9	0.07	0.28	0.37
		1800	63	77	8.9	0.11	0.43	0.56
		2100	94	116	13.47	0.17	0.65	0.85
Breakfast	Idli , Dhal Sambar	1200	126	232	7.38	0.72	1.18	0.85
		1800	189	348	11.07	1.08	1.77	1.28
		2100	283	522	16.61	1.62	1.61	1.93
Mid Time	Apple	1200	38	20	0.06	0.25	0.34	0.34
		1800	57	30	0.1	0.38	0.51	0.51
		2100	86	45	0.15	0.45	0.77	0.77
Lunch	Rice, Dhal With Rasam, Amaranth,Buttermilk, Vegetable salad	1200	367	261.4	7.3	0.56	1.15	2.36
		1800	551	392.1	10.95	0.89	1.73	3.54
		2100	827	588.2	16.17	1.34	2.6	5.31
Tea	Bengal gram Sundal ,Tea Horse	1200	59	153.4	2.16	2.04	1.7	1.73
		1800	89	230.2	3.24	3.06	2.6	2.60
		2100	133	345.0	4.86	4.60	4.0	3.91
Dinner	Rava uppuma , Bengal Gram dhal Chutney	1200	135	121.8	4.83	7.1	0.5	5.7
		1800	203	182.8	7.25	10.65	0.75	8.6
		2100	304	274.0	10.88	15.98	1.13	13.0
Bed Time	Milk	1200	19	13	0.48	0.13	-	0.18
		1800	29	20	0.72	0.02	-	0.28
		2100	43	30	1.09	0.04	-	0.44
	Total	1200		815	28.24	10.7	4.82	32.9
		1800		1223	42.36	16.1	7.23	49.42
		2100		1820	63.54	24.15	10.85	74.14

Table XIII

Ready Reckoner for the Second day formulated diet

				Analysed Values For Cooked Foods				
Timings	Menu	Calorie diet (Kcal)	Total cooked wt (g)	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vitamin – C (g)
Early Morning	Milk (with Soyaflakes)	1200	42	51	5.9	0.07	0.28	0.37
		1800	63	77	8.9	0.11	0.43	0.56
		2100	94	116	13.47	0.17	0.65	0.85
Breakfast	Chapathi , Peas Curry	1200	141	154	5.68	0.8	1.62	2.62
		1800	211	231	8.52	1.2	2.43	3.94
		2100	317	347	12.78	1.8	3.65	5.92
Mid Time	Lemon juice	1200	38	26	0.2	0.16	0.2	7.4
		1800	57	39	0.3	0.24	0.3	11.1
		2100	86	58	0.45	0.38	0.45	16.7
Lunch	Rice, Phulkas, Vegetable Kuruma, Palak curry, TomatoRasam, Buttermilk	1200	312	343	15.8	3.72	2.5	21.8
		1800	468	515	23.84	5.59	3.75	32.71
		2100	694	773	35.76	8.39	5.63	49.07
Tea	Green gram Sundal , Tea	1200	76	93	2.8	0.02	0.18	1.5
		1800	114	139	4.3	0.03	0.28	2.3
		2100	171	208	6.5	0.05	0.43	3.5
Dinner	Rava Dosai , Vegetable kuruma	1200	141	142	9.64	0.42	1.56	0.32
		1800	211	213	14.46	0.64	2.35	0.48
		2100	317	319	21.70	0.97	3.53	0.72
Bed Time	Milk	1200	19	13	0.48	0.13	-	0.18
		1800	29	20	0.72	0.62	-	0.28
		2100	43	30	1.09	0.04	-	0.42
	Total	1200		815	40.6	5.5	6.38	34.6
		1800		1223	61.00	8.36	9.58	52.0
		2100		1801	92	12.55	14.38	78.1

Table XIV

Ready Reckoner for the Third day formulated diet

				Analysed Values For Cooked Foods				
Timings	Menu	Calorie diet (Kcal)	Total cooked wt (g)	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vitamin – C (g)
Early Morning	Milk (with Soyaflakes)	1200 1800 2100	42 63 94	51 77 116	5.9 8.9 13.47	0.07 0.11 0.17	0.28 0.43 0.65	0.37 0.56 0.85
Breakfast	Wheat Dosai , Coriander Chutney	1200 1800 2100	111 166 249	210 315 472	7.6 11.5 17.3	1.30 1.96 2.94	1.42 2.14 3.21	5.86 8.80 13.33
Mid Time	Pine apple	1200 1800 2100	38 57 86	17 26 39	0.14 0.22 0.34	0.03 0.05 0.08	0.18 0.28 0.42	14.8 22.2 33.4
Lunch	Rice,Brinjalsambar, Beans Curry , TamarindRasam , fenugreek leaves kootu , Buttermilk	1200 1800 2100	375 563 844	297 445 667	9.4 14.1 21.61	2.1 3.2 4.81	1.48 2.22 3.33	29.91 44.87 67.31
Tea	Bread Sandwich , Tea	1200 1800 2100	74 111 167	93 140 210	3.25 4.88 7.32	0.52 0.79 1.19	5.8 8.7 13.1	2.45 3.68 5.52
Dinner	Wheat uppuma , Onion Sambar	1200 1800 2100	111 166 249	145 218 327	4.29 6.44 9.67	0.32 0.48 0.72	0.22 0.34 0.51	1.04 1.56 2.35
Bed Time	Milk	1200 1800 2100	19 29 43	13 20 30	0.48 0.72 1.09	0.13 0.02 0.04	- - -	0.18 0.28 0.44
	Total	1200 1800 2100		831 1246 1809	31.3 47.0 70.8	4.02 6.03 9.96	3.50 5.26 9.4	54.4 81.7 122.65

Table XV

Ready Reckoner for the Fourth day formulated diet

				Analysed Values For Cooked Foods				
Timings	Menu	Calorie diet (Kcal)	Total cooked wt (g)	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vitamin – C (g)
Early Morning	Milk (with Soyaflakes)	1200	42	51	5.9	0.07	0.28	0.37
		1800	63	77	8.9	0.11	0.43	0.56
		2100	94	116	13.47	0.17	0.65	0.85
Breakfast	Ven Pongal , Dhal Sambar	1200	129	147	5.34	0.5	0.32	1.6
		1800	194	220	8.02	0.75	0.48	2.5
		2100	291	330	12.04	1.13	0.73	3.75
Mid Time	Orange	1200	38	14	0.19	0.053	0.085	8.73
		1800	57	21	0.29	0.08	0.128	13.13
		2100	86	31	0.44	0.12	0.192	19.7
Lunch	Rice, Spinach with dhal , TomatoRasam, Sundakai Puli kulombu , Plantain stem curry , Buttermilk	1200	347	277	7.04	1.35	2.46	16.76
		1800	520	415	10.56	2.025	3.7	25.15
		2100	780	623	15.84	3.038	5.89	37.73
Tea	Channa Sundal , Tea	1200	61	161	7.3	2.05	1.6	2.5
		1800	91	241	11.0	3.08	2.4	3.8
		2100	137	362	16.0	4.62	3.7	5.7
Dinner	Adai , mint chutney	1200	137	163	19.4	0.66	1.10	3.96
		1800	206	245	29.2	1.00	1.66	5.94
		2100	300	367	43.8	1.572	2.5	8.92
Bed Time	Milk	1200	19	13	0.48	0.13	-	0.18
		1800	29	20	0.72	0.02	-	0.28
		2100	43	30	1.09	0.04	-	0.44
	Total	1200		802	40.6	4.05	5.5	28.14
		1800		1203	61.0	6.08	8.3	42.22
		2100		1805	91.67	10.67	13.0	63.34

Table XVI

Ready Reckoner for the Fifth day formulated diet

				Analysed Values For Cooked Foods				
Timings	Menu	Calorie diet (Kcal)	Total cooked wt (g)	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vitamin – C (g)
Early Morning	Milk (with Soyaflakes)	1200	42	51	5.9	0.07	0.28	0.37
		1800	63	77	8.9	0.11	0.43	0.56
		2100	94	116	13.47	0.17	0.65	0.85
Breakfast	Pulkas , Dhal masiyal	1200	122	165	6.5	0.90	0.81	0.84
		1800	183	248	9.8	1.36	1.22	1.26
		2100	274	372.6	14.71	2.04	1.83	1.84
Mid Time	Apple	1200	38	16	0.07	0.17	0.37	0.37
		1800	57	34	0.11	0.26	0.56	0.56
		2100	86	51	0.17	0.4	0.85	0.85
Lunch	Vegetable Rice , Onion Raita , Amaranth Poriyal, Curd Rice	1200	333	255	100.4	1.6	5.7	26.45
		1800	500	382	15.06	2.4	8.6	39.68
		2100	750	573	22.6	3.7	13.0	59.52
Tea	Marie Biscuit , Tea	1200	42	69.3	4.20	0.76	0.12	0.56
		1800	63	104.6	6.31	1.14	0.19	0.85
		2100	94	157.0	9.47	1.71	0.29	1.28
Dinner	Rava Dosai , Idli , Vegetable kuruma , Peas Sambar	1200	137	241	8.0	0.64	1.32	4.6
		1800	206	362	12.0	0.96	1.98	6.9
		2100	309	543	18.01	1.44	2.97	10.42
Bed Time	Milk	1200	19	13	0.48	0.13	-	0.18
		1800	29	20	0.72	0.02	-	0.28
		2100	43	30	1.09	0.04	-	0.44
	Total	1200		809	37.4	4.20	8.01	33.4
		1800		1214	56.24	6.31	12.02	50.10
		2100		1805	74.36	9.47	19.00	75.16

Table XVII

Ready Reckoner for the Sixth day formulated diet

				Analysed Values For Cooked Foods				
Timings	Menu	Calorie diet (Kcal)	Total cooked wt (g)	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vitamin – C (g)
Early Morning	Milk	1200	42	51	5.9	0.07	0.28	0.37
		1800	63	77	8.9	0.11	0.43	0.56
		2100	94	116	13.47	0.17	0.65	0.85
Breakfast	Ragi Dosai ,Onion Sambar	1200	118	149	3.95	0.59	1.89	5.24
		1800	177	224	5.93	0.89	2.84	7.86
		2100	266	366	8.90	1.34	4.27	11.8
Mid Time	Orange	1200	38	14	0.19	0.05	0.086	8.7
		1800	57	21	0.29	0.08	0.128	13.13
		2100	86	31	0.44	0.12	0.184	20.0
Lunch	Rice, Ladies finger Puli kulambu,TomatoRasam, Carrot kootu, Bottle ground poriyal ,Buttermilk	1200	320	305	9.36	1.52	1.32	23.54
		1800	480	457	14.04	2.28	1.99	35.32
		2100	720	686	21.07	3.42	2.99	52.92
Tea	Vegetable Sandwich , Tea	1200	57	95	3.25	0.52	0.5	2.24
		1800	86	142	4.88	0.79	0.75	3.36
		2100	129	213	7.32	1.19	1.31	5.52
Dinner	Kichidi , Dhal Sambar	1200	167	187	5.0	0.50	2.10	3.03
		1800	251	231	7.6	0.76	3.16	4.55
		2100	377	421	11.4	1.52	4.75	6.83
Bed Time	Milk	1200	19	13	0.48	0.13	-	0.18
		1800	29	20	0.72	0.02	-	0.28
		2100	43	30	1.09	0.04	-	0.44
	Total	1200		806	28.32	3.38	4.94	5.39
		1800		1209	42.48	5.08	7.41	8.09
		2100		1821	63.72	7.92	11.16	12.14

Table XVIII

Ready Reckoner for the Seventh day formulated diet

				Analysed Values For Cooked Foods				
Timings	Menu	Calorie diet (Kcal)	Total cooked wt (g)	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Vitamin – C (g)
Early Morning	Milk (with Soyaflakes)	1200	42	51	5.9	0.07	0.28	0.37
		1800	63	77	8.9	0.11	0.43	0.56
		2100	94	116	13.47	0.17	0.65	0.85
Breakfast	Rava Dosai ,Channa Kuruma	1200	113	303	11.26	1.60	2.18	8.75
		1800	169	454	16.9	2.41	3.28	13.13
		2100	253	680	25.4	3.71	4.93	19.67
Mid Time	Orange	1200	38	14	0.19	0.05	0.08	8.86
		1800	57	21	0.29	0.08	0.12	13.3
		2100	86	31	0.44	0.12	0.18	20.0
Lunch	Tomato Rice, Onion Raita, Fish curry, Curd rice , Vegetable Salad	1200	364	253	16	1.62	2.79	8.4
		1800	546	380	24	2.43	4.19	12.6
		2100	819	570	36	3.65	6.29	18.9
Tea	Marie Biscuit , Tea	1200	42	51	3.26	0.6	0.12	0.18
		1800	63	77	4.89	1.0	0.19	0.28
		2100	94	115	7.34	1.6	0.29	0.42
Dinner	Pulkas , Dhal Masiyal	1200	135	160	6.64	0.81	0.88	0.96
		1800	205	240	9.96	1.22	1.32	1.45
		2100	304	360	14.45	1.84	1.98	2.18
Bed Time	Milk	1200	19	13	0.48	0.13	-	0.18
		1800	29	20	0.72	0.02	-	0.28
		2100	43	30	1.09	0.04	-	0.44
	Total	1200		820	36.84	4.9	6.15	26.49
		1800		1230	55.26	7.4	9.23	39.74
		2100		1875	87.39	11.10	13.85	59.61

IV Testing the effect of formulated diet on blood cholesterol level of the selected Cardio Vascular Disease patients .

Diet has an important role in maintaining an ideal body weight, body fat and normal blood lipids levels . Increased body weight and blood lipids and the development of cardiovascular diseases , are in fact the end results of prolonged faulty dietary habits (Ghafoorunissa and Krishnaswamy , 1994) .

Current dietary recommendations to prevent Cardivascular disease involve reducing weight , limiting fats to 30 percent or less of all kilocalories , maintaining an optimal ratio between PUFA - monounsaturated fats and saturated fats (Williams , 1997) .Long - term high intake of many vegetable oils , and linolenic acid or long chain n - 3 poly unsaturated fatty acids reduce the risk of coronary heart disease (Ghafoorunissa , 1998) .

As the part of the study , ten patients were selected by random sampling , who were having regular visists for their medical check up by to Krithika Hospital , Salem .

An interview method was adopted to find out their family back - ground informations like age, sex , education , occupation , monthly income , dietary pattern , age of onset , risk factors , management of their treatment etc.

A. GATHERING BACKGROUND INFORMATION

The selected ten patients were belonged to the age range of 45 - 75 years . Seventy five percent of the selected patients were literate and were engaged in sedentary work . Physical inactivity and middle age are associated with an increased risk of cardiovascular

disease and mortality as stasted by Hartung, 1990. Seventy percent of the patients belonged to middle income group (Rs 4500 to 7500 as suggested by HUDCO, 1997,) and 20 and 10 percent of patients belonged to low income group and high income group respectively. Sixty percent of the patients were nonvegetarians and consumming coffee regularly. Ten to 15 percent of the selected patients consumed alcohol and tobacco occasionally.

B. DIETORY PATTERN OF THE SELECTED PATIENTS

Seventy five percent of the selected patients were found to consumed only refined oils. Sixty percent of the patients follow drgs and exercise as regular mode of treatment and giving less important to their dietry modifications. The mean food and nutrient intake of ten patients are given in the following table.

TABLE XIX

Mean Food Intake of selected cardiovascular patients

Food Items	RDA (g)		Mean Intake (g)		Percent deficit / Surplus	
	Men	Women	Men	Women	Men	Women
Cereals	375	375	300	300	-75	-75
Pulses	45	45	55	50	+10	+5
Green Leafy Veg	75	75	100	100	+25	+25
Roots & Tubers	85	85	50	40	-35	-45
Other Vegetables	70	70	50	50	-30	-10
Fruits	30	30	50	50	+30	+30
Milk & Milk Products	225	225	250	250	+25	+25
Sugar & jaggery	25	25	20	20	-5	-5
Fats & Oils	40	40	50	50	+10	+10
Meat , Fish & Poultry	30	30	40	40	+10	+10

TABLE XX

Mean Nutrient Intake of the selected cardiovascular patients

Nutrients	ICMR - RDA Values		Amount of Intake		Percent deficit / Surplus	
	Men	Women	Men	Women	Men	Women
Calories (Kcal)	2425	1875	1875	1725	-550	-150
Protein (g)	60	50	65	55	+5	+5
Fat (g)	20	20	30	25	+10	+5
Calcium (Mg)	400	400	350	325	-50	-75
Iron (Mg)	28	30	28	25	-	+5
β-Carotene (µg)	2400	2400	2200	2100	-200	-300
Vitamin - C (mg)	40	40	50	50	+10	+10

From the Table it is clear that pluses , green leafy vegetables , fruits , milk and milk products , fats and oils and meat , fish and poultry are sufficient quantity whereas cereals , roots and tubers , sugar and Jaggery were in not adequate in quantity.

In the case of the mean nutrient intake of protein fat and vitamin - C were found to be sufficient whereas calories, calcium, iron and β - carotene are deficit in quantity.

C. Implementing the formulated diets for testing the effect on blood cholesterol level

At the begining of the study, there was a great difficulty in convincing all the ten patients to follow formulated diets. After having repeated dietary advises and councelling by the investigator and dietition of Krithika hospital the selected ten patients were willing to follow the above diets for short period of 10 days. Later, out of the ten selected patients, three patients were found to be co-operative and convinced for adpting this formulated diets for 30 days strictly. They also expressed that these formulated diets were highly suitable for CVD patients without having much deviation from the normal routine diet.

The case study of the three selected patients are given in the following pages.

Case Study - I :

Name : Mr. K. Ramasami

Age : 74 Years

Height : 165 cms

Weight : 63 Kgs

BMI : 23

Address : M-51, Highway colony, Salem- 636 005.

Family backround of Mr. K. Ramasami is as follows: He is at age of 74 years and belonging to middle income group having Rs 5000/- as his monthly income. He is retired vetenary doctor . He is in a nuclear family, where his wife is also a CVD patient. Thus , the study was easy to conduct by implementing the formulated diet and to find out the effect of diet on blood cholesterol level.

Regarding the risk factors, since, his father was also a Cardiovascular disease patient it was found to be heredity to him. The subject was found to consume only sunflower oil but the quantity was higher than ICMR - RDA values. The patient was found to be physically inactive by having sedentary [illegible] activity pattern.

The dietry pattern found from the recall method was that the patient was non vegetarian and his mean foods and nutrients intake of three days are given in the following Tables.

Table - XX

The Mean Food intake - (Case - I)

ICMR

Food Items	RDA (g)	Mean Intake (g)	Percent deficit / Surplus
Cereals	375	300	-75
Pulses	45	65	+20
Green Leafy Veg	75	100	+25
Roots & Tubers	85	40	-45
Other Vegetables	70	50	-20
Fruits	30	50	+20
Milk & Milk Products	225	300	+75
Sugar & jaggery	25	10	-15
Fats & Oils	40	50	+10
Meat , Fish & Poultry	30	50	+20

TABLE - XXI

The Mean Nutrient Intake (Case - I)

Nutrients	ICMR - RDA Values	Amount Of Intake	Percent deficit / Surplus
Calories (Kcal)	2425	1875	-550
Protein (g)	60	65	+5
Fat (g)	20	35	+15
Calcium (Mg)	400	350	-50
Iron (Mg)	28	25	-3
β-Carotene (µg)	2400	2200	-200
Vitamin - C (Mg)	40	50	+10

From the above Table it is clear that the amount of cereals, roots and tubers, other vegetables and sugar and jaggery are in deficit where as pulses, green leafy vegetables, fruits, milk and milk products, fats and oils and meat, fish and poultry were adequate in quantity.

The mean intake of nutrients were sufficient for protein, fat and vitamin-c whereas , energy calcium, iron and β - carotene were found in deficit.

The mode of treatment followed by him was diet, drug and exercise. The diet suggested by the investigator and dietitian is 1800 Kcal diet since his BMI [BMI = wt (Kg) / Ht^2 (m)] was 23 daily 25 gm / of (SBO : GNO) oil combination was used for the preparation of 30 day diets stickly along with his prescribed drugs.

To find out the effect of the formulated diets on blood chlolesterol level it is recomended to record the initial and final blood cholosterol levels of 229 mg % and 210 mg % respectively and the data revealed that there is a marked difference in the blood cholesterol level. There may be significant difference in blood cholesterol level , if the patient might be followed the formulated diet for long duration.

Case Study - II :

Name : Mrs. Santhalakshmi

Age : 62 years Address: M-51, Highway colony,

Height : 153 cms

Weight : 57 Kgs Salem- 636 005.

BMI : 23

Family backround of Mrs . Santhalakshmi nuclear family she belonging to doing and all house hold activities . She is at age of 62 years and belonging to middle income group having Rs 5000/- as her monthly income. since both husband and wife were Cardiovascular disease patients , implementing the formulated diets was found to be easy.

Regarding the risk factors since , her mother was hypertensive it was found to be heredity to her. The subject was found to consume coffee frequently , which is considered as one of important risk factor. The subject uses only sunflower oil for cooking purpose. Patient do not follow any regular exercise except doing household duties.

The dietary pattern collected from the recall method showed that the patient was non - vegetarian, consume coffee and also following irregular in dietary timings.

TABLE - XXII

The Mean Food intake (Case - II)

Food Items	RDA (g)	Mean Intake (g)	Percent deficit / Surplus
Cereals	375	300	-75
Pulses	45	65	+20
Green Leafy Veg	75	100	+25
Roots & Tubers	85	40	-45
Other Vegetables	40	30	-10
Fruits	30	50	+20
Milk & Milk Products	225	300	+75
Sugar & jaggery	25	20	-5
Fats & Oils	40	50	+10
Meat , Fish & Poultry	30	50	+20

TABLE - XXIII

The Mean Nutrient Intake (Case - I I)

Nutrients	ICMR - RDA Values(1989)	Mean Intake	Percent deficit / Surplus
Calories (Kcal)	1875	1725	-150
Protein (g)	50	55	+5
Fat (g)	20	30	+10
Calcium (Mg)	400	325	-75
Iron (Mg)	30	25	-5
β-Carotene (µg)	2400	2000	-400
Vitamin - C (Mg)	40	45	+5

From the above Table it is clear that the amount of cereals, roots and tubers, other vegetables and sugar and jaggery are in deficit where as pulses, green leafy vegetables, fruits, milk and milk products, fats and oils meat, fish and poultry were adequate in quantity.

The mean intake of nutrients were sufficient for protein, fat and vitamin - c where as energy , calcium, iron and β - carotene were found in deficit.

The only method of treatment followed by her was having drugs regularly. The formulated 1800 Kcal diet was advised to her by investigator and dietitians since her BMI [BMI = wt (Kg) / Ht^2 (m)] was 23 Daily 25 gm/ day of (SBO : GNO) oil combination as given for the preparation of diets stickly along with her prescribed drugs for 30 days.

To find out the effect of formulated diets on blood cholestrol level, blood cholesterol levels before and after experimental period of 30 days were recommended to record. The blood cholestrol levels were found to be 276 mg % and 258 mg %., (Normal = < 200 mg %) before and after experimental period respectively. Their might be marked change if experimental period is prolonged.

Case Study - III:

Name	: T.Sarojini		
Age	: 64 Years	Address	: 314, Chinnaputhu street,
Height	: 152 cms		
Weight	: 63 Kgs		Salem- 636 004.
BMI	: 27		

Mrs. Sarojini aged 64 years and is obese the coming under is low income family by having Rs 4000 / - as their monthly income . The patient is a graduate and belonging to a joint family , doing certain house hold activities. The dietary pattern collected from the recall method showed the patient was non vegetarian , consume coffee and also irregular in dietary timings.

TABLE - XXIV

The Mean Food Intake (Case - III)

Food Items	RDA (g)	Mean Intake (g)	Percent deficit / Surplus
Cereals	375	300	-75
Pulses	45	65	+20
Green Leafy Veg	75	100	+25
Roots & Tubers	85	40	-45
Other Vegetables	40	30	-10
Fruits	30	50	+20
Milk & Milk Products	225	300	+75
Sugar & jaggery	25	20	-5
Fats & Oils	40	50	+10
Meat , Fish & Poultry	30	50	+20

TABLE XXV

The Mean Nutrient Intake (Case - III)

Nutrients	ICMR - RDA Values	Amount Of Intake	Percent deficit / Surplus
Calories (Kcal)	1875	1725	-150
Protein (g)	50	55	+5
Fat (g)	20	30	+10
Calcium (Mg)	400	350	-50
Iron (M g)	30	28	-2
β-Carotene (µg)	2400	2200	-200
Vitamin - C (Mg)	40	45	+5

From the above Table it is clear that the amount of cereals, roots and tubers, other vegetables and sugar and jaggery are in deficit whereas pulses, green leafy vegetables, fruits, milk and milk products, fats and oils , meat, fish and poultry were adequate in quantity.

The mean intake of nutrients were sufficient for protein, fat and vitamin-c whereas energy , calcium, iron and β - carotene were found in deficit.

The main mode of treatment followed by her was using drugs. but of The formulated 1200 Kcal diet was advised for her by investigar and dietitians since BMI [BMI = wt (Kg) / Ht^2 (m)] was 27 daily 20 gm of (SBO : GNO) oil combinations was given for the preparation of 30 day diets and also advised to follow her prescribed drugs.

To find out the effect of formulated diets on blood cholestrol level, blood cholestrol levels before and after experimental period of 30 days were recommended to record. The blood cholestrol levels were found to be 342 mg % and 310 mg %., (Normal = < 200 mg %) before and after experimental period respectively. Their might be marked change , if experimental period is prolonged.

Summary and Conclusion

SUMMARY AND CONCLUSION

The present study entitled " FORMULATING AND TESTING DIETS SUITABLE FOR CARDIOVASCULAR PATIENTS" with the objectives of formulating diets suitable for cardiovascular patients, by developing a ready reckoner table to show the nutrient content of the formulated diet and to test the effect of formulated diets on blood cholesterol level of the selected cardiovascular patients.

Three different calorie diets 1800 kcal, 1600 kcal and 2100 kcal suitable for cardiovascular patients were formulated for seven days by consulting the dietitians of well known hospitals in Coimbatore and Salem Town. These formulated diets help to maintain their health status by preventing further complications of cardiovascular diseases. and were mainly prepared by using simple moist heat methods. The quality and quantity of the food ingredients used in the preparations were carefully selected and were used for calculating and analysing their nutrient content of calories, protein, fat, fibre and vitamin - c for developing ready reckoner table. The formulated diets implemented on patients to find out effect on blood cholesterol level.

Key findings of the study are as follows:

(1) 1200 Kcal, 1800 Kcal and 2100 kcal diets for seven days were formulated by using different vegetable oil combinations in different quantity which were mainly body weight , based on calorie diet is suggested according to the CBI of the cardiovscular patients.

(2) 1200 kcal diet was used mainly as weight reducing diet for the persons having BMI 25 & above for both sexes , by using 395 g of cereal and cereal products , 69 g of pulses , 93 g of leafy vegetables , 49 g of other vegetables ,54 g of roots and tubers, 98 g of fruits , 229 g of milk and milk products and 19 g of fats and oils . This diet provides 208 g of carbohydrate , 56 g of protein and 16 g of fat .

(3) 1800 Kcal diet was used for CVD patients who are having normal body weight with BMI of 18 . 5 to 25 for both sexes by using cereals of 444 g , 77 g of pulses , 105 g of green leafy vegetables , 55 g of other vegetables , 61 g of roots and tubers , 111 g of fruits , 21 g of fats and oils , 257 g of milk and milk products . This diet contributes 312 g of carbohydrate , 78 . 5 g of protein and 24 g of fat .

(4) 2100Kcal diet was suggested for CVD patients who are underweight and BMI is less than 18.5. The amount of cereals used was 518 g , 90 g, of pulses , 122 g of green leafy vegetables , 64 g of other vegetables , 71 g of roots and tubers , 129 g of fruits , 25 g of fats and oils and 300g of milk and milk products . This diet provides 364 g of carbohydrate , 91.6 g of protein and 29 g of fat .

(5) The various vegetable oil combinations and their ratio used in this study are SUN : PO : MO (2 : 1 : 1), GNO : MO (3 : 1), SUN : PO (1 : 1) and SBO : GNO (1 : 2) . The amount of oils used where carefully divided into 4 or 5 parts for preparing a day menu of 1200 or 1800 or 2100 Kcal diet .

(6) The amount of nutrients present in raw and cooked food stuffs in formulated diets were carefully calculated and analysed for developing ready reckoner table for seven days .

(7) The ready reckoner table gives informations regarding weight of cooked items and nutrients of calories , protein , fat , fibre and vitamin - C present in each days menu .

(8) Ten CVD patients were selected by random sampling method for gathering information regarding age , sex , dietary pattern , age of onset of CVD, risk factors, signs and symptoms , treatment followed to cure complications of CVD. Out of ten CVD patients , three patients were found to be co - operative in following the formulated diet with the given oil combination strictly. The investigator also gathered ,

(9) Prevalence of CVD is high among male and middle aged persons aged between 45 and 60 with irregular dietary pattern These factors are considered as common CVD provoking factors . From the collected data that , 75 percent were literate and were engaged in sedentary work . Seventy percent of the patients belonged to middle income group (4500 - 7500 ₹) , 20 and 10 percent belonged to low and high income group respectively .

(10) Among patients , it was found that the amount of consumption of cereals , roots and tubers, other vegetables , sugar and jaggery were lesser than the ICMR - RDA (1989) values whereas pulses , fat , fruits , milk and milk products and meat , fish and poultry were found to be adequate in quantity.

(11) The mean nutrient intake was sufficient in case of protein , fat , iron and vitamin - C whereas calories , calcium and β - carotene were found to be deficit.

(12) From the data it was clear that they consumed mainly vegetable oils like sunflower , safflower and gingelly oils . but the quantity is higher than their daily requirement .

(13) In the mode of treatment of CVD , 75 percent of the patients gave more importance to the drugs and exercise than to their modified dietary pattern . Thus , a set of formulated diet was advised to follow carefully with proper dietary councelling by using 25 g of oil combinations

(14) Based on BMI , calorie diets is suggested to follow carefully for 30 days and For the patient having the BMI , in the range of 18 . 5 , 25 , he is advised to follow 1800 Kcal diet , and for BMI 25 and 18 . 5 the patients were advised to follow 1200 and 2100 Kcal diet respectively .

(15) After the experimental period of 30 days , blood cholesterol level was taken and compared with initial blood cholesterol level . which has taken before starting the study . It was found that the blood cholesterol level was reduced from 9 to 6 percent . This may have marked change , if experimental period is prolonged .

Suggestions and Recommendations :

(1) The same study can be continued for further in depth studies using various vegetable oil combinations for the preparation of the formulated diets suitable for Cardiarvascular patient

(2) The same study can be done for the single aspect of cardiovascular diseases such as hypertension , Myocardial infraction , Atherosclerosis etc .

(3) The study can be repeated to formulate diets for various other disease conditions like peptic ulcer, liver diseases, kidney diseases etc.

(4) The Ready reckoner tables can be used in hospitals, for prescribing diets and

(5) Softwares can be developed for different calorie diets based on risk factors and complications of patients and BMI.

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Appendices

Appendix - I

Questionnaire On Formulating And Testing Diets Suitable For Cardiovascular Patients

1. Name of the Interviewee :

2. Name of the Interviewer :

3. Date : 4. Phone No :

5. Address :

6. Weight : 7. Height :

8. Information On Family Background :

S . No	Name and Relation to interviewer	Age	Education	Occupation	Monthly Income

9. Are you a cardiovascular Disease Patient

Yes ☐ No ☐

10. How did you come to know that you are CVD patient .
    a. Abnormal perspiration b. Persistent Headache
    c. Chest Pain d. Unusual discomfort in the chese
    e. Palpitation f. Any other

11. Name others in your family who are having CVD
    a. Father b. Mother c. Husband
    d. Inlaws e. Any other

12. What form of CVD you are having .
    a. Atherosclerosis b. Myocardial Infarction
    c. Angina pectoris d. Stroke e. Hypertension

13. Do you have any other complications other than CVD

Yes ☐ No ☐

14. If yes, Name your complication.

a. Diabetes Mellitus b. Obesity c. Hypertension
d. Kidney Disorder e. Liver disorder
f. Peptic ulcer g. Any other

15. Do you undergo special Medication other than allopathy

yes ☐ No ☐

16. How often do you consult your doctor?

a. Once in fifteen days b. Monthly
c. Once in a year d. Twice yearly
e. Any other

17. Do you follow your Medicine regularly

yes ☐ No ☐

18. What are the drugsw that you consume regularly for CVD

Medicine	Frequency	Dosage

19. Do you follow a set of dietary pattern recommended by doctor and dietitians.

yes ☐ No ☐

If yes, which dietary pattern do you follow

a. 1200 Kcal b. 1600 Kcal c. 2100 Kcal
d. Any other .

20. What are the cereals that you consume commonly

Items	Amt Per week (g)	Frequency	Preparation
Rice Rice Flour Wheat Wheat Flour Oats Ragi Corn flakes Any other			

21. What are the green leafy vegetables that you consume

Items	Amt Per week (g)	Frequency	Preparation
Agathi Amaranth Arakeerai Cabbage Colacasia leaves Coriander leaves Fenugreek leaves Mustard leaves Manathakali Spinach Any other			

22. Name the roots and tubers you consume

Items	Amt Per week (g)	Frequency	Preparation
Potato Carrot Beetroot Onion Raddish Any other			

23. Name the other vegetables that you consume

Items	Amt Per week (g)	Frequency	Preparation
Beans Bitter gourd Ash gourd Bottle gourd Kovaikai Plantain Stem Plantain flower Sundaikai Khol - khol Ladies - finger			

24. Mention the types oil products used for cooking

Items	Quantity Per Week
Refined oil (Brand name) Gingelly oil Mustard oil	

25. Mention the type of fatty foods that you consume

Items	Quantity / Week	Frequency
Ghee		
Butter		
Cheese		
Milk		
Curd		
Mutton		
Chicken		
Fish		
Egg		
Coconut		
Groundnut		
Chashewnut		
Others		

26. Mention the type of sodium rich foods that you consume

Items	Quantity / Week	Frequency
Pappad		
Vadam		
Pickle		
Cutlet		
Samosa		
Murukku		
Salt Biscuit		
Sweet Biscuit		
Cake		
Others		

27. Do you consume alcohol

Yes ☐ No ☐

If Yes, Specify

Items	Amount / Week	Frequency
Beer		
Brandy		
Whisky		
Wine		
Other		

28. Do you have smoking habits

Items	Frequency / Day
Beedi	
Cigarette	
Pan	
Tobacco	

29. Do you consume coffee ?

Yes ☐ No ☐

If Yes, specify Frequency per day.

30. Are you willing to follow a new dietarty pattern other than you follow presently.

Yes ☐ No ☐

31. Mention your three days recall of your dietary pattern.

Day	Time	Menu Item
I EM		
BF		
MM		
Lunch		
Tea		
Dinner		
II EM		
BF		
MM		
Lunch		
Tea		
Dinner		
III EM		
BF		
MM		
Lunch		
Tea		
Dinner		

32. Do you feel exercise is helpful

Yes ☐ No ☐

If Yes, list out the same

Exercise	Frequency	Time
Walking Swimming Cycling Yoga Others		

33. Do you feel exercise is helpful.

Yes ☐ No ☐

If Yes, How it helps you ?

34. Blood Lipid profile

	Initial	Final
Cholesterol Triglyceride		

Appendix - II

Menu and Amount of Raw Ingredients used in 2100 Kcal diet

First Days Menu

Timing	Menu	Raw Ingredients	Weight(g)
E/M	Milk	Milk	100ml
		Sugar	10g
		Parboiled Rice	125g
	Idli	Black gram dhal	30g
B/F	Dhal Sambar	Fenugreek seeds	5g
		Red gram dhal	10g
		Tomato	5g
		Garlic	5g
		Small onions	10g
		turmeric powder	2g
		Oil	5g
M/M	Applle	Apple	100g
		Raw Rice	150g
	Rice	Red gramdhal	15g
Lunch	Dhal with	Amaranth	100g
	Amaranth	Garlic	5g
	Rasam, Butter	Carrot	25g
	milk ,	Onion	10g
	Vegetable	Cucumber	25g
	Salad	Green chillies	10g
		Tamarind pulb	10g
		Tomato	20g
		Butter milk	100g
Tea	Milk , Bengal	Turmeric powder	2g
	gram sundal	Coriander leaves	10g
		Milk	50ml
		Sugar	5g
		Bengal gram	100g
		Green chillies	5g
		Onion (small)	10g
		Oil	5g
	Rava Upma	rava	60g
	Bengal gram	Green chillies	5g
Dinner	dhal chutney	Bengal gram dhal	25g
		(Roasted)	85g
		Garlic	5g
		Coriander leaves	10g
		Onion	10g
Bed time	Milk	Oil	5g
		Milk	50ml
		Sugar	5g

Second Days Menu

Timing	Menu	Raw Ingredients	Weight(g)
E/M	Milk	Milk	100ml
		Sugar	15g
		Soyaflakes	10g
	Chapathi	Wheat flour	100g
B/F	Peas Curry&	Potato	10g
	Potato	Green chillies	5g
		Garlic	5g
		Ginger	5g
		Tamarind pulbs	5g
		Turmeric powder	2g
M/M	Lemon Juice	Lemon juice	50ml
		Sugar	5g
	Rice	Raw Rice	100g
Lunch	Phulkas	oil	10g
	Vegetable kuruma	Wheat flour	50g
	palat curry	Soyabean	25g
	Tomato Rasam	potato	25g
	Butter milk	Carrot	15g
		Onion	10g
		Tomato	10g
		Coriander leaves	10g
		palak	100g
		Green chillies	10g
		Tamarind pulb	5g
		Butter milk	100g
		Garlic	5g
		Ginger	5g
Tea	milk ,	Milk	50ml
	Green gram sundal	Sugar	5g
		Green gram	100g
		Green chillies	5g
		Oil	5g
Dinner	Rava Dosai	rava	60g
	kuruma	Potato	15g
		Oil	5g
		Carrot	10g
		onion (big)	5g
		Tomato	5g
		Garlic	5g
		Ginger	5g
Bed time	Milk	Milk	50ml
		Sugar	5g

Third Days Menu

Timing	Menu	Raw Ingredients	Weight(g)
E/M	Milk	Milk	100ml
		Sugar	10g
		Soyaflakes	10g
	Wheat Dosai	Wheat flour	150g
B/F	Coriander chutney	oil	5g
		Coriander leaves	10g
		Curry leaves	10g
		Green chillies	5g
		Bengal gram dhal	5g
		Garlic	5g
M/M	Pine apple	Pine apple	100g
		Raw Rice	150g
	Rice	Brinjal	25g
Lunch	Brinjal sambar	Beans	25g
	Tamarind Rasam	Onion (big)	10g
	Beans curry	Tomato	10g
	Fenugreek leaves kooking	Fenugreek leaves	100g
		Bengal gram dhal	15g
	Butter milk	Green chillies	5g
		Turmeric powder	2g
		Coriander leaves	10g
		Tamarind pulb	5g
		Butter milk	100g
		Red gram dhal	15g
		Oil	15g
Tea time	Bread Sandwich	Bread (2 slices)	75g
	milk	Carrot	25g
		Onion (big)	10g
		Tomato	10g
		Cucumber	25g
		Milk	50ml
		Sugar	5g
Dinner	Wheat upma	Wheat semohita	100g
	Dhal sambar & onian	Red gram dhal	10g
		Onion (small)	25g
		Green chillies	5g
		Tomato	5g
		Oil	5g
Bed time	Milk	Milk	50ml
		Sugar	5g

Fourth Days Menu

Timing	Menu	Raw Ingredients	Weight(g)
E/M	Milk	Milk	100ml
		Sugar	10g
		Raw Rice	75g
	Ven Pongal	Green gram dhal	25g
B/F	Dhal Sambar	Onion	10g
		Tomato	10g
		Turmeric powder	5g
		Green chillies	5g
		Red gram dhal	10g
		oil	5g
M/M	orange	Orange	100g
	Rice	Raw Rice	150g
Lunch	Spinach with dhal	Spinach	75g
	Tomato Rasam	Tomato	10g
	Sundakkai	Coriander leaves	5g
	pulikulambu	Tamarind pulb	5g
	plantain stem	Sundakkai	25g
	curry	Plantain stem	50g
	Butter milk	Red gram dhal	10g
		Butter milk	100g
		Green chillies	10g
		onion	20g
		Garlic	5g
		Oil	10g
Tea time	milk	Milk	50ml
	Channa Sundal	Sugar	5g
		Bengalgram (whole)	100g
		Onian (small)	10g
		Green chillies	5g
		Oil	5g
		Raw Rice	50g
Dinner	Adai	Red gram dhal	20g
	Mint chutney	Green gram (Whole)	20g
		Onian (small)	10g
		Green chillies	10g
		Mint	20g
		Oil	5g
Bed time	Milk	Milk	50ml
		Sugar	5g

Fifth Days Menu

Timing	Menu	Raw Ingredients	Weight (g)
E/M	Milk	Milk	150ml
		Sugar	10g
	Phulkas - 6	Soya flakes	10g
B/F	Dhal masiyal	Wheat flour	100g
		Red gram dhal	20g
		Tomato	5g
		Turmeric powder	5g
		Garlic	5g
		oil	5g
M/M	Apple	Apple	100g
Lunch	Vegetable Rice	Raw Rice	100g
	Raita	Beans	25g
	Curd rice	Carrot	25g
	Amaranth poriyal	Tomato	10g
		onion	10g
		Potato	25g
		Garlic	10g
		Ginger	10g
		Green chillies	10g
		Curd	50ml
		Oil	15g
		onion	10g
		Raw rice	50g
		Butter milk	50ml
		Amaranth	100g
		Green chillies	5g
		Coriander leaves	10g
		Maida	50g
Tea time		Milk	150ml
	Marie Biscuit	sugar	10g
	Tea	Par boiled rice	125g
Dinner		Black gram dhal	30g
	Idli	Fenugreak seeds	10g
	Peas Sambar	oil	5g
		Peas	25g
		Green chillies	5g
		Tamarind pulb	5g
		Tomato	10g
		Onion	5g
		Garlic	10g
		Ginger	10g

Sixth Days Menu

Timing	Menu	Raw Ingredients	Weight (g)
E/M	Milk	Milk	100ml
		Sugar	10g
	Ragi Dosai	Soya flakes	10g
B/F	onion sambar	Ragi flour	100g
		onion	20g
		Green chillies	10g
		Red gram dhal	10g
		Coriander leaves	5g
		Oil	5g
M/M	Orange	Orange	100g
		Raw rice	150g
Lunch	Rice	Ladies finger	50g
	Ladies finger pulikulambu	Tamarind Pulp	5g
	Tomato Rasam	Tomato	10g
	Carrot kootu	onion	10g
	Bottle gourd poriyal	Oil	5g
	Butter milk	Green chillies	5g
		Bottle gourd	50g
		Corrot	25g
		Bengal gram dhal	50g
		Garlic	5g
		Butter milk	100ml
		Curry leaves	10g
		Bread	75g
		Corrot	25g
		Onion	10g
		Tomato	10g
		cucumber	25g
	Sand wich	Milk	50ml
Tea time	Milk	Sugar	5g
		Rava	100g
Dinner	Kichidi	Vermicelli	25g
	Dhal sambar	Green chillies	5g
		Onion (big)	10g
		Coriander leaves	5g
		Red gram dhal	15g
		Tamarind pulp	5g
		Oi l	5g
Bed Time	Milk	Milk	50ml
		Sugar	5g

Seventh Days Menu

Timing	Menu	Raw Ingredients	Weight (g)
E/M	Milk	Milk	100ml
		Sugar	10g
	Rava Dosai	Bread slice - 6 in - no	225g
B/F	Channa Curry	Bengal gram (Whole)	50g
		Potato	50g
		onion	20g
		Tomato	10g
		Green chillies	5g
		Coriander leaves	5g
		Oil	5g
M/M	Orange	Orange	100g
Lunch	Tomato Rice	Raw rice	100g
	Fish curry	Tomato	75g
	Onion raita	onion	25g
	Curd rice	Green chillies	10g
	Vegetable Salad	Fish	100g
		Butter milk	100g
		Raw rice	50g
		cucumber	25g
		Corrot	25g
		Oil	15g
		Maida	25g
Tea time	Marie Biscuit	Milk	50ml
	Milk	Sugar	5g
		Wheat flour	100g
Dinner	Pulkas	Red gram dhal	20g
	Dhal Masiyal	Tomato	5g
		Garlic	5g
		Onion	5g
		Oil	5g
		Milk	50ml
Bed Time	Milk	Sugar	5g