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A Study on Nutritional Status, Behaviour and Life Style Management among Coronary Heart Disease Patients Aged 40-60 Years

Madhuri Chandala

Dietician, Narayana Hrudayala Hospital, Narayana Hrudayalaya, Hyderabad, Telangana, India

V. Bindhu

Assistant Professor, Department of Home Science, Sri Padmaavathi Mahila Visvavidyalayam, Tirupati, Andhra Pradesh, India

V. Revathi

Lecturer, Department of Nutrition, Spandana Degree College, Vansthalipuram, Hyderabad, Telangana, India

Abstract:

Introduction: In India, heart disease affects people of all ages but is most frequent in middle age and most often cause by atherosclerosis. With urbanisation and economic development, a nutritional transition characterised by improvement in socio economic status and increasingly sedentary life style have been observed which has contributed to the increasing prevalence of coronary heart disease among the adult population.

Objectives: The study was exploratory and aimed at assessing the diet and life style patterns, nutritional status and estimating the prevalence of coronary heart disease risk factors among the patients followed by a nutrition education programme. Strict adherence to all the prescribed dietary modification and life style changes shows significant improvement in biochemical parameters.

Methodology: Patients aged 25-60 years from hospital Narayan Hrudayalaya underwent anthropometric measurements (body mass index) Body fat percentage, protein mass, body fat mass skeletal mass etc., A detail interview will be conducted with the help of structured questionnaire. Questionnaire contain four parts, personal details, family history, life style and nutrition questions (frequency questionnaire, 24recall, etc...)

Conclusion: In patients with hypertension, the combination of diet control and behavioural modification effectively lower the B.P and may be useful in treating and reducing Coronary heart disease risk factors

1. Introduction

Coronary Artery Disease occurs when Atherosclerotic plaque (hardening of the arteries) builds up in the wall of the arteries that supply the heart. This plaque is primarily made of cholesterol. Plaque accumulation can be accelerated by smoking, high blood pressure, elevated cholesterol, and diabetes. Patients are also at higher risk for plaque development if they are older (greater than 45 years for men and 55 years for women), or if they have a family history of early heart artery disease.

The atherosclerotic process causes significant narrowing in one or more coronary arteries. When coronary arteries narrow more than 50% to 70%, the blood supply beyond the plaque is not enough to meet the increased oxygen demand during exercise. The heart muscle in the area of these arteries becomes starved of oxygen (ischemic). Patients often experience chest pain (angina) when the blood oxygen supply cannot keep up with demand. Up to 25% of patients experience no chest pain at all, despite a lack of adequate blood and oxygen supply. These patients have "silent" angina, and have the same risk of heart attack as those with angina.

Substantial Medical Research over last 60 years has unveiled the cause of many disorders. But in the modern age beset with the great stress and tension in life is having its own toll on health of people resulting in various medical disorder. These problem are often compounded by the facts that there is latency and delay between cause and event or manifestation of the disease.

The prevalence of this disease in India causes 3 million deaths per year accounting for 25% of mortality (Tanuja Rartogi et al, 2004). Cholesterol is an important component in the human body because it is a basic structure component of cell wall and different hormones (especially sex hormones and steroids). Only 5% of cholesterol actually circulate in the body and that 5% is what can build up in arteries and lead to coronary heart disease.

World Health Organization (WHO) has highlighted the importance of raised blood cholesterol as a risk factor for Coronary Heart Disease (CHD) and estimates that over 60% of CHD and 40% of ischemic stroke in developed countries is due to total blood cholesterol levels in excess of the theoretical minimum 3.8mmol/L

In India, a heart disease effect people of all ages, but are most frequent in middle age and most often cause by atherosclerosis. With urbanization and economic development, a nutrition transition characterized by improvement in socio-economic status and increasingly sedentary life style have been observed which has contributed to the increasingly prevalence of Coronary Heart Disease among the adult population.

The linkage between unhealthy diet and CHD have been examined extensively in a range of epidemiological studies (animal, metabolic, observation and clinical trials) with certain dietary compounds being found to increase (saturated fats, trans fats, salts, refined carbohydrates) or decrease (fruits and vegetables, poly unsaturated fat, nuts, fish) the risk of CHD. But in protection of this disease the mechanism of its action is attributed to its binding to bile salt and preventing its re absorption as well as in reducing cholesterol levels. (U.S. Department of Health and Human Services (HHS)) (2008)

Researchers have suggested that incorporating regular physical activity, avoiding smoking, maintaining ideal body weight and following some diet rich in whole grains, fruit and vegetables, Omega 3 fatty acid rich items and unsaturated fat as the predominant form of dietary fat could prevent the majority of CHD in western population. Jonson et al, (1992) Studied preventive nutrition which enumerates the disease prevention through dietary management is a cost effective approach in promoting healthy aging, fat, cholesterol, physical activity and behavioural changes affects the morbidity and mortality of coronary heart disease. As new understanding is gained about the relationship between dietary patterns and disease outcomes, the role of nutrition is likely to grow as a public policy priority. It has been predicted that healthier dietary practices could save millions of rupees in medical costs, lost productivity and the value of lives lost prematurely to heart disease.

1.1. Epidemiological

Epidemiological evidences suggest that dietary changes associated with the nutritional transition, specifically the increase consumption of energy dense diet high in unhealthy fats, oils, sodium, and sugars have contributed to an increase in CHD incidences in low and middle income countries (Hu.2008). Excessive and harmful intake of alcohol clearly increases in CHD risk (Lucas et al., 2005).

Overall, the epidemiologic data revealed excess risk of fatal and nonfatal CHD events was directly related to total cholesterol and low-density lipoprotein (LDL) cholesterol levels, for both men and women and for both younger (< 65 years) and older (> or = 65 years) patients, over a wide range of serum cholesterol levels. The predictive value was higher in younger men than older men and women, although part of this quantitative interaction may be due to fewer studies, with fewer end points, in the older and female populations. The CHD events and CHD mortality, but not total mortality, were consistently reduced in trials of cholesterol-lowering therapy. The regression trials, predominantly in CHD patients with high cholesterol values (mean 7.1 mmol/L), demonstrated improvement in angiographic atherosclerosis in every study. The evidence for elevated risk of non-CHD death at very low levels of cholesterol is uncertain and controversial. The most likely possibilities for this apparent relationship are unknown confounding variables and the play of chance. (Montague T et al., 1994)

Genetic have a positive association with CHD. As from decades, family history of CHD is correlated with increased atherosclerotic risk of heart disease. Although, CHD has sometimes been considered as disease that predominantly affects man but globally it is the leading cause of death among both men and women (Jackson,2008).

A recent review of the global burden of high blood pressure found that approximately 40 percent of IHD stroke, 75percent of hypertensive disease, and 60 percent of other CHD were attributable to hypertension. This parallels to approximately 7.6 million deaths, or 13.5percent of the total number of annual global deaths, attributed to high blood pressure (Lawes et al., 2008)

1.2. Significance of the Study

With the achievement of affluence followed by urbanization it has been found that the people tend to give up millets in preference to fine polished wheat and rice and low intake of fruits and vegetables. As a result, obesity, lifetime incidence of hypertension and metabolic syndrome are emerging rapidly yet CHD remains the number one cause of death accounting to more than 40percent fatalities across the world. Despite remarkable pharmacological and reducing the incidence of chronic degenerative disease such as atherosclerosis is to realign our current maladaptive diet, behavioral changes and lifestyle. Although it is neither practical nor even possible to replicate all prehistoric living conditions today these diet and lifestyle characteristics should serve as a template to design and test effective intervention to reduce the incidence of degenerative CHD. Considering all the risk factors, the increasing global trends of CHD and the importance of human health, the present study conducted at Narayana Hrudayalaya Hospitals, Jeedimetla, Hyderabad.

Since CHD is becoming a major health issue, the investigator wanted to study the nutritional behavior and health status of patients and risk factor among the selected group and to counsel the patient for dietary modifications accordingly.

1.3. Objectives

- i. To study the prevalence of Coronary Heart Disease and the risk factors among the selected group.
- ii. To assess the nutritional status and health status of selected subject with Coronary Heart Disease
- iii. To assess the life style pattern of selected group.
- iv. To determine the prevalence of various life style coronary risk factor and their association with Coronary Heart Disease.
- v. To create awareness about the risk of Coronary Heart Disease through Nutrition education / Nutrition counseling

1.4. Hypothesis

1. Nutritional status of the coronary heart disease patients is poor.
2. The level of physical activity of subjects is poor.
3. Understanding the relationship between Diet and Health status of the subjects.
4. There is no significant change in behavioral status.

2. Review of Literature

Coronary Heart Disease has been aptly called 20th century disease. It is a worldwide disease with local differences in incidence, severity and natural history. In the urbanized nation one third of all deaths in men between 45 and 65 are due to Coronary Heart Disease. One way to reduce the risk of developing the disease is lower serum cholesterol levels by making dietary changes. Serum cholesterol can be reduced by including vegetables and fruits rich in fiber (Arch Intern Med. 2003 Sep 8; 163).

According to World Health Organization WHO has highlighted the important of raised blood cholesterol as a risk factor for coronary heart disease (CHD) and estimate that over 60% of CHD and 40% of ischemic stroke in developing countries is due to total blood cholesterol levels in excess of the theoretical minimum 3.8mmol/L.

2.1. Studies on Prevalence of CHD

Buddha Bassy (2002) reported that, 16.7 million people died from cardiovascular disease, accounting for 30.3% of all deaths worldwide. More than half of these death was in developing countries. India, prevalence of coronary heart disease has been reported as being 11% in 2001.

Coronary heart diseases have emerged as a major health burden worldwide. Cardio vascular diseases contributed to 15.3 million deaths in 1996 of which 5.5 million was from developed countries (Sania Nighta, 2001), reported that the prevalence of coronary heart disease in India are 11%.

A study on prevalence of impaired left ventricular systolic function and heart failure in a middle aged and elderly urban population segment of Copenhagen was done by Raymond et al., 2003. It was concluded that impaired left ventricular systolic function and heart failure increased substantially with age and was more than twice as frequent among men as among women.

In 2000, more than half the world 16.7 million deaths from Cardio vascular deaths were seen in developing countries, many of these in South Asia (WHO 2001). Coronary deaths in India are expected to double over 20 years and reach 2 million by 2010 (Ghaffar et al., 2004)

The elevation of blood pressure above normal is called hypertension, is a major risk factor contributing to coronary heart disease.

2.2. Causes of Coronary Heart Disease

Coronary heart disease (CHD) starts when certain factors damage the inner layers of the coronary arteries. These factors include:

- Smoking
- High levels of certain fats and cholesterol in the blood
- High blood pressure

- High levels of sugar in the blood due to insulin resistance or diabetes
- Blood vessel inflammation

Plaque might begin to build up where the arteries are damaged. The buildup of plaque in the coronary arteries may start in childhood. Over time, plaque can harden or rupture (break open). Hardened plaque narrows the coronary arteries and reduces the flow of oxygen-rich blood to the heart. This can cause angina (chest pain or discomfort).

If the plaque ruptures, blood cell fragments called platelets (PLATE-lets) stick to the site of the injury. They may clump together to form blood clots.

Blood clots can further narrow the coronary arteries and worsen angina. If a clot becomes large enough, it can mostly or completely block a coronary artery and cause a heart attack.

2.3. Risk factors for Coronary Heart Disease

Certain traits, conditions, or habits may raise your risk for CHD. The more risk factors you have, the more likely you are to develop the disease, control many risk factors, which may help prevent or delay CHD

2.3.1. Risk Factors

- Unhealthy blood cholesterol levels. This includes high LDL cholesterol (sometimes called “bad” cholesterol) and low HDL cholesterol (sometimes called “good” cholesterol).
- High blood pressure. Blood pressure is considered high if it stays at or above 140/90 mmHg over time. If you have diabetes or chronic kidney disease, high blood pressure is defined as 130/80 mmHg or higher. (The mmHg is millimeters of mercury—the units used to measure blood pressure.)
- Smoking. Smoking can damage and tighten blood vessels, lead to unhealthy cholesterol levels, and raise blood pressure. Smoking also can limit how much oxygen reaches the body's tissues.

- Insulin resistance. This condition occurs if the body can't use its own insulin properly. Insulin is a hormone that helps move blood sugar into cells where it's used for energy. Insulin resistance may lead to diabetes.
- Diabetes . With this disease, the body's blood sugar level is too high because the body doesn't make enough insulin or doesn't use its insulin properly.
- Overweight or obesity. The terms "overweight" and "obesity" refer to body weight that's greater than what is considered healthy for a certain height.
- Metabolic syndrome. Metabolic syndrome is the name for a group of risk factors that raises your risk for CHD and other health problems, such as diabetes and stroke.
- Lack of physical activity. Being physically inactive can worsen other risk factors for CHD, such as unhealthy blood cholesterol levels, high blood pressure, diabetes, and overweight or obesity.
- Unhealthy diet. An unhealthy diet can raise your risk for CHD. Foods that are high in saturated and *trans* fats, cholesterol, sodium (salt), and sugar can worsen other risk factors for CHD.
- Older age. Genetic or lifestyle factors cause plaque to build up in your arteries as you age. By the time you're middle-aged or older, enough plaque has built up to cause signs or symptoms. In men, the risk for CHD increases after age 45. In women, the risk for CHD increases after age 55.
- Family history of early heart disease. Your risk increases if your father or a brother was diagnosed with CHD before 55 years of age, or if your mother or a sister was diagnosed with CHD before 65 years of age.

Although older age and a family history of early heart disease are risk factors, it doesn't mean that you'll develop CHD if you have one or both. Controlling other risk factors often can lessen genetic influences and help prevent CHD, even in older adults.

2.3.2. Emerging Risk Factors

Researchers continue to study other possible risk factors for CHD. High levels of a protein called C-reactive protein (CRP) in the blood may raise the risk of CHD and heart attack. High levels of CRP are a sign of inflammation in the body.

Inflammation is the body's response to injury or infection. Damage to the arteries' inner walls may trigger inflammation and help plaque grow.

Research is under way to find out whether reducing inflammation and lowering CRP levels also can reduce the risk of CHD and heart attack.

High levels of triglycerides (tri-GLIH-seh-rides) in the blood also may raise the risk of CHD, especially in women. Triglycerides are a type of fat.

2.3.3. Other Risks Related to Coronary Heart Disease

Other conditions and factors also may contribute to CHD, including:

- Sleep apnea. Sleep apnea is a common disorder in which you have one or more pauses in breathing or shallow breaths while you sleep. Untreated sleep apnea can increase your risk for high blood pressure, diabetes, and even a heart attack or stroke.
- Stress. Research shows that the most commonly reported "trigger" for a heart attack is an emotionally upsetting event, especially one involving anger.
- Alcohol. Heavy drinking can damage the heart muscle and worsen other CHD risk factors. Men should have no more than two drinks containing alcohol a day. Women should have no more than one drink containing alcohol a day.
- Preeclampsia (pre-e-KLAMP-se-ah). This condition can occur during pregnancy. The two main signs of preeclampsia are a rise in blood pressure and excess protein in the urine. Preeclampsia is linked to an increased lifetime risk of heart disease, including CHD, heart attack, heart failure, and high blood pressure.

2.4. Signs and Symptoms of Coronary Heart Disease

A common symptom of coronary heart disease (CHD) is angina. Angina is chest pain or discomfort that occurs if an area of your heart muscle doesn't get enough oxygen-rich blood.

Angina may feel like pressure or squeezing in your chest. You also may feel it in your shoulders, arms, neck, jaw, or back. Angina pain may even feel like indigestion. The pain tends to get worse with activity and go away with rest. Emotional stress also can trigger the pain.

Another common symptom of CHD is shortness of breath. This symptom occurs if CHD causes heart failure. When you have heart failure, your heart can't pump enough blood to meet your body's needs. Fluid builds up in your lungs, making it hard to breathe.

The severity of these symptoms varies. They may get more severe as the buildup of plaque continues to narrow the coronary arteries. Some people who have CHD have no signs or symptoms—a condition called silent CHD. The disease might not be diagnosed until a person has signs or symptoms of a heart attack, heart failure, or an arrhythmia (an irregular heartbeat).

2.4.1. Heart Attack

A heart attack occurs if the flow of oxygen-rich blood to a section of heart muscle is cut off. This can happen if an area of plaque in a coronary artery ruptures (breaks open). Blood cell fragments called platelets stick to the site of the injury and may clump together to form blood clots. If a clot becomes large enough, it can mostly or completely block blood flow through a coronary artery. If the

blockage isn't treated quickly, the portion of heart muscle fed by the artery begins to die. Healthy heart tissue is replaced with scar tissue. This heart damage may not be obvious, or it may cause severe or long-lasting problems.

The most common heart attack symptom is chest pain or discomfort. Most heart attacks involve discomfort in the center or left side of the chest that often lasts for more than a few minutes or goes away and comes back. The discomfort can feel like uncomfortable pressure, squeezing, fullness, or pain. The feeling can be mild or severe. Heart attack pain sometimes feels like indigestion or heartburn. The symptoms of angina can be similar to the symptoms of a heart attack. Angina pain usually lasts for only a few minutes and goes away with rest.

Chest pain or discomfort that doesn't go away or changes from its usual pattern (for example, occurs more often or while you're resting) might be a sign of a heart attack. All the chest pains should be checked by a doctor. Other common signs and symptoms of a heart attack include:

- Upper body discomfort in one or both arms, the back, neck, jaw, or upper part of the stomach
- Shortness of breath, which may occur with or before chest discomfort
- Nausea (feeling sick to your stomach), vomiting, light-headedness or fainting, or breaking out in a cold sweat
- Sleep problems, fatigue (tiredness), or lack of energy

2.4.2. Heart Failure

Heart failure is a condition in which your heart can't pump enough blood to meet your body's needs. Heart failure doesn't mean that your heart has stopped or is about to stop working. The most common signs and symptoms of heart failure are shortness of breath or trouble breathing; fatigue; and swelling in the ankles, feet, legs, stomach, and veins in the neck. All of these symptoms are the result of fluid buildup in your body. When symptoms start, you may feel tired and short of breath after routine physical effort, like climbing stairs.

2.4.3. Hypertension

Hypertension is major risk factor contributing to coronary heart disease, in view of the fact that both atheroma and hypertension increase with age. According to Holly et al., (1981), the various dietary factors at high levels for example sodium elevated blood pressure.

Joffres 1992 reported that 16 percent men and 13 percent of women had diastolic blood pressure of 90mm Hg or greater or were on treatment or both. About 26 percent of these subjects were unaware of their hypertension, 42 percent were being treated and their condition controlled hypertensive subjects showed a higher prevalence of elevated total cholesterol, high body mass index, diabetes and sedentary lifestyle than normotensive subjects. Most people with elevated blood pressure were in the 90-95mmHg range for diastolic pressure and 140-160 mm Hg range for systolic pressure. Prevalence of high isolated systolic blood pressure sharply increased in men (40 percent) and women (49 percent) of 60-75 years old.

2.4.4. Hyperlipidemia

Albrink et al. (1961) and Brown et al., (1964) showed that hypertriglyceridemia has also been associated with increased prevalence of Coronary Heart Disease.

Michael (1997) has done a study on the fasting triglyceride – high density lipoproteins and risk of myocardial infarction. The interrelationship of fasting triglycerides, other lipid parameters and non-lipid risk factor with risk of myocardial infarction among 340 cases were examined. It was observed that a significant association of elevated fasting triglycerides with risk of myocardial infarction. A large meta-analysis of 17 trials reported hypertriglycerides to be an independent risk factor for coronary heart disease. In the study an 88g/dl

(1.0M Mol/l) increase in plasma triglycerides levels significantly increased the relative risk of coronary heart disease by approximately 30 percent in men and 75 percent in women (Cullen, 2001).

Research has shown that a high level of LDL (bad cholesterol) is a risk factor for cardiac diseases. According to this article good cholesterol (HDL) and bad cholesterol (LDL) assesses the role of triglycerides in the heart disease, and offer strategies for cholesterol lowering and heart disease prevention (Maki, Shinnik, 2003)

Elevated levels of lipoproteins are associated with increased Coronary heart disease risk in adult. It may be important to estimate plasma lipoprotein. Lipoprotein levels in progeny with a familiar history of premature coronary heart disease because it seems possible to identify those subjects who are greater risk for later coronary heart disease either with or without elevated LDL – Cholesterol levels (Dirisamer et al., 2003)

A study on the lipid profile in adolescent Filipinos was done by Christopher Kuzawa and Linda Dair (2003). The objective of the study was to test the maternal arm fat area in the trimester of pregnancy and birth weight of offspring's risk of Cardiovascular Disease. 296 male and 301 female offspring were followed up to measure their lipid profile. The result showed that mothers with low energy status during pregnancy gave birth to male offspring who had a high Cardiovascular Diseases risk in adolescences and female are less consistent with fetal origin.

2.4.5. Obesity

Hubert et al., (1983) stated that obesity is considered an independent risk factor in young adults. It has been shown that children who are overweight have increased chance for development of hypertension. In addition, Obesity is associated with alternation in serum

lipids, glucose intolerance, insulin resistance and hyperlipidemia. All these complications associated with obesity are risk factors for cardio vascular disease was significantly higher in the obese group (Body Mass Index, lean<20, normal 20-25, Obese >25) than in control (Gundurao and white 1993).

In the study, Body Mass Index, Anthropometric measurements and body fat profile of obese and non – obese subjects are evaluated and correlated those values with Cardio vascular risk factor. In this cross sectional study 639 subjects were (170 men and 469 women) involved. This study shows that Asian Indians have excess cardiovascular risk at BMI and waist circumference values considered 'Normal' Vikram et al., (2003).

2.4.6. Alcoholism

There is a universal agreement that a high consumption of alcohol is an important preventable cause of death. It is also well established that consumption of more approximately two alcoholic drinks per day is associated with higher levels of blood pressure. While heavy drinking has been shown in at least seven different studies to increase mortality, including Coronary Heart Disease mortality, other studies raise the possibility that moderate alcohol consumption might beneficial. Some studies have reported increased levels of HDL2 fraction while, Hartung et al., (1993) found HDL2 and HDL3 were raised.

Kristi Reynold (2004) has done a study on alcohol consumption and risk of stroke. The aim of the study was to examine the association between alcohol consumption and relative risk of stroke. The analysis revealed that a significant non- linear relationship between alcohol consumption and hemorrhage stroke. It was concluded that heavy alcohol consumption increases the relative risk of the stroke while light or moderate alcohol consumption may be protective against total and ischemic stroke.

2.4.7. Smoking

Sinha et al., (1985) studied on the effect of smoking on blood pressure, body weight, Electro Cardiogram and serum cholesterol in young hypertensive smoker, normotensive smokers and normotensive non smokers (controls). Effect of smoking was observed in the first two groups. Smoking caused a rise in mean systolic, diastolic and mean blood pressure of both hyper and normotensive as compared to controls. The rise was greater in hypertensive than normotensive.

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Coronary Heart Disease are responsible for over 5, 00, 000 deaths annually in the United States. Cigarette smoking is attributed to be causing approximately 30 percent of these utilities. Atherosclerosis is the major contributing cause for peripheral vascular disease (95 percent), greater than70 percent of the patient with this disorder are believed to be smokes. Cigarette smoking contain many component, but only two major compounds have been extensively studies (nicotine and carbon monoxide). Smoking related injury seems to affect lipid metabolism, blood pressure platelet and endothelial cell function (Gundurao and whites, 1993)

2.4.10. Physical Activity

According to Orinish et al., (1990) comprehensive life style changes may be able to bring about regression of even severe coronary arthrosclerosis after one year without use of lipid- lowering drugs

Claudia et al., (2007) stated that regardless of LVEF (left ventricular ejection fraction), patients showed significant improvement in life style behavior, body weight, body fat, blood pressure, resting heart rate, total LDL cholesterol, exercise capacity and quality of life by 3 months. Most improvements were maintained over 12 months.

In view of Camila Strid et al., (2012) cardiac rehabilitation should include high intensity, in the long duration and intervention content covering information, knowledge, practical training, self care activity and behavior change in order to achieve effect on the all four lifestyle factor of diet, physical activity and exercise, smoking and stress. Life style change can be reached in less lifestyle factors with longer duration and a variation of intensity of contacts but in combining with an informative and education content with an additional content of practical nature or self-activity.

In a study conducted by Lee Stoner (2012), cardiac vascular disease is the driving force behind the discrepancy in life expectancy between the indigenous groups in many countries. Much of the risk can be offset through lifestyle changes.

Wexler et al., (2012) studies that therapeutic lifestyle change like reduce sodium diet, the DASH diet, weight loss, moderation of alcohol consumption and increased aerobic exercise is important in treatment of CHD.

Lifestyle modification may lower the risk of any coronary heart disease events and hospital readmission in people with heart disease, reported by Chiara Waure et al., (2013)

2.4.11. Stress

Kwon and Houlden (1994) found that the psychological stress with academic examination is associated with atherogenic changes of lipid and lipoprotein profile. This is not related to consumption of dietary fat, saturated fatty acids or cholesterol, but it may be related to effect of stress hormones

2.5. Role of Nutrition on Coronary Heart Diseases

The dietary approach to the prevention and treatment of hypertension is an integral part of the lifestyle changes that are required to control BP as suggested by Tamam N Mohamad, MD et al., (2013). The lifestyle measures that are widely agreed to lower BP or Cardiovascular Risk, and should be considered in all patients are:

- Smoking cessation
- Weight reduction in the overweight or weight stabilization
- Moderation of alcohol consumption
- Physical activity
- Healthy dietary choices, which include:
 - Reduction of salt intake
 - Increase in potassium intake through increase in fruit and vegetable
 - Consumption
 - Decrease in saturated and total fat intake.

2.5.1. Diet

A study conducted by Linda Van Horn (1997) showed that the diet high in complex carbohydrates and fiber are associated with reduced mortality rates from CHD and other chronic diseases. Fiber found in barley, pectin rich fruits and vegetables provide adjunction lipid- lowering benefits beyond those achieved by reduction in total and saturated fat alone

Cirag (1997) stated that consuming some diet rich in plant foods will provide a milieu of phyto chemical, non – nutritive substances in the plant that possess health protective benefits. Nuts, whole grains, fruits and vegetables containing an abundance of phenolic compounds, terpenoids, pigments and other natural anti oxidants that have been associated with protection from and for chronic disease such as heart disease, cancer, diabetes and hypertension as well as other medical conditions

Susan Fried and Salome Rai (2003) studied on sugar, hypertriglyceridemia and Cardio Vascular Disease, in term of the long term effect of diet high in sugars on the risk of Cardio Vascular Diseases. Available epidemiologic evidence indicates associated of sugar in total carbohydrates intake parse, but high dietary glycemic load associated with higher serum triglycerides concentration and greater risk of coronary heart disease in women.

A study on relationship between dietary intake to subsequent Coronary Heart Disease incidence was done by Garcia Palmieri et al., (2003). A study of base line nutrients intake of 8218 urban and rural Puerto Rican man, aged 45-65 years was undertaken in the relation to subsequent six years Coronary Heart disease incidence urban. The results of the study revealed that Urban dietary intake were significantly higher in total fat and lower in carbohydrates, particularly starch. Urban serum cholesterol values were significantly higher than rural values.

Diet is a cornerstone for improving unfavorable lipid profile. Studies continue to support dietary advice that focuses educing cholesterol as well as saturated and trans fatty acid intake, eating more vegetables, fruits and whole grains and preventing obesity. By achieving these goals, people can after reduce their LDL cholesterol by 10-15percent (Ronald et al., 2002).

2.5.2. Fats

According to Hooper (2001) There is a consistent support for the hypothesis that both the quality and quantity of fat are directly associated with the elevation of most blood lipids particularly LDL cholesterol. It has largely been observed that high intake of fats particularly saturated fat result in elevation of serum total cholesterol, saturated and mono saturated and poly unsaturated fatty acids. They may be invisible like fats present in various foods or visible like fats used in cooking.

They have seen potentially important reduction in coronary heart disease with reduction or modification of dietary fat intake, Ravnskov (1998) studied The questionable role of saturated and poly unsaturated fatty acids in Coronary Heart Disease and reported that saturate fats are increasing cholesterol levels and poly saturated fats are reducing cholesterol levels.

In a study it was reported that quantities effect on Cardio Vascular Disease risk factor and Coronary Heart Disease risk of replacing partially hydrogenated vegetable oil by high fat meal TNF-a levels are increase in the subjects with the metabolic syndrome; more over a high fat meal produces further increase in its levels associated with endothelial dysfunction. (European Clin.Nutr. 2009).

2.5.3. The Salt (and sodium) Recommended for Hypertensive Patient

Epidemiological studies suggest that dietary salt intake is a contributor to BP elevation and to the prevalence of hypertension. Restriction of sodium intake to 2 g per day lowers systolic pressure, on average, by 3.7–4.8mmHg and lowers diastolic pressure, on average, by 0.9–2.5 mmHg, although the reductions vary from person to person beyond these ranges. Randomized controlled trials in hypertensive patients indicate that reducing sodium intake by 80–100 mmol (4.7–5.8 g of sodium chloride) per day from an initial intake of around 180 mmol (10.5 g of sodium chloride) per day reduces BP by an average of 4–6 mmHg, although the trials also showed a great degree of variation between patients. Salt sensitivity is common in older patients with hypertension. Despite concern that salt restriction for all patients with hypertension may have adverse consequences, moderate sodium restriction appears to be generally safe and effective and particularly so in older people. The recommended adequate daily sodium intake has been recently reduced from 100 to 65 mmol/day, corresponding to 3.8 g/day of sodium chloride, (NH LBI, November, 2002)

2.5.4. Beverages

The high intake of caffeinated coffee may influence BP or the risk of Coronary Heart Disease. A single dose of caffeine of 200–250 mg, equivalent to 2–3 cups of coffee, has been shown to increase systolic BP by 3–14mmHg and diastolic BP by 4–13mmHg shortly after intake in normotensive subjects. However, the cardiovascular system may develop tolerance to caffeine. The objective of a meta-analysis was to quantify the chronic effect (≥ 7 days) of regular coffee and caffeine intake on BP, using data from randomized controlled trials. According to the results, regular caffeine intake increases BP, although the pressure effect of caffeine was only small if ingested through coffee. More research is needed on the cardiovascular effects of caffeine and caffeinated foods and beverages other than coffee, such as cola and sports drinks. In general, a habitual intake of about 400mg of caffeine per day (3–4 cups of coffee) does not increase the risk of hypertension, and nor does it affect BP control.

Many studies have shown a U- or J-shaped association of mortality with alcohol consumption, in which light and moderate drinking results in a reduced mortality compared with non-drinkers, while heavy drinkers have a rising death rate. However, some population studies indicate that the relationship between alcohol consumption, BP levels and the prevalence of hypertension is linear in populations. Beyond that, high levels of alcohol consumption are associated with a high risk of stroke; this is particularly so for binge drinking. Alcohol attenuates the effects of antihypertensive drug therapy, but this effect is at least partially reversible within 1–2 weeks by moderating one's drinking. Trials of alcohol reduction have shown a significant reduction in systolic and diastolic BP. Hypertensive patients who drink alcohol should be advised to limit their consumption to no more than 20–30 g ethanol per day for men, and hypertensive women to no more than 10–20 g ethanol per day and they should be warned against the increased risk of stroke associated with binge drinking.

Epidemiological and metabolic studies suggest that calcium, potassium and magnesium may have a role in the regulation of BP. However, results from systematic reviews and meta-analyses have reached conflicting conclusions about whether oral supplementation of these minerals can reduce BP. Moreover, a recent Cochrane Systematic Review attempted to evaluate the effects of combined mineral supplementation as a treatment for primary hypertension in adults, but it found no robust evidence that supplements of any combination of potassium, magnesium or calcium reduce mortality, morbidity or BP in adults. Evidence so far does not support the routine supplementation with calcium, potassium or magnesium in hypertensive patients.

A recent meta-analysis of randomized controlled trials concluded that dynamic aerobic endurance training reduces resting systolic and diastolic BP by 3.0/2.4 mmHg, respectively and daytime ambulatory BP by 3.3/3.5 mmHg, respectively. The reduction in resting BP was more pronounced in the hypertensive group (–6.9/–4.9 mmHg) than in the normotensive one (–1.9/–1.6 mmHg). Even moderate levels of exercise lowered BP, and this type of training also reduced body weight, body fat and waist circumference and increased insulin sensitivity and high-density lipoprotein (HDL) cholesterol levels. Sedentary patients should be advised to take up exercise of moderate intensity on a regular basis, e.g. 30–45 min daily.

The type of exercise should primarily be an endurance-based activity (walking, jogging, swimming) supplemented by moderate resistance exercise. Intensive resistance exercise, such as heavy weight lifting, can have a marked pressure effect and should be avoided. If hypertension is poorly controlled, heavy physical exercise as well as maximal exercise testing should be discouraged or postponed until appropriate drug treatment has been instituted and BP lowered.

Improving diet and lifestyle is a critical component of the American Heart Association's (AHA) strategy to prevent cardiovascular disease, the leading cause of morbidity and mortality in several countries (NH LBI, November, 2002).

- Consume an overall healthy diet.
- Aim for a healthy body weight.
- Aim for recommended levels of low-density lipoprotein (LDL) cholesterol.
- High-density lipoprotein (HDL) cholesterol and triglycerides.
- Aim for a normal BP.

- Aim for a normal blood glucose level.
 - Be physically active.
 - Avoid use of and exposure to tobacco products.
- The AHA has composed certain guidelines for the achievement of the above mentioned
- Goals for the reduction of cardiovascular disease risk, as follows:
 - Balance calorie intake and physical activity to achieve or maintain a healthy body weight.
 - Consume some diet rich in vegetables and fruits.
 - Choose wholegrain, high-fibre foods.
 - Consume fish, especially oily fish, at least twice a week.
 - Limit the intake of saturated fat to <7% of energy, trans fat to <1% of energy and cholesterol to <300mg per day by:
 - Choosing lean meats and vegetable alternatives
 - Selecting fat-free (skimmed), 1% fat and low-fat dairy products
 - Minimizing intake of partially hydrogenated fats.
 - Minimize intake of beverages and foods with added sugars.
 - Choose and prepare foods with little or no salt.
 - If alcohol is consumed, it should be done in moderation.
 - For consumption of food that is prepared outside of the home, the AHA's (NH LBI, November, 2002)

2.6. Role of Behavioral and Life style management in Coronary Heart Diseases

According to Ornish et al., (1990) comprehensive lifestyle changes may be able to bring out regression of even severe Coronary Atherosclerosis after 1 year without use of lipid-lowering drugs. In a study conducted by Lee stoner (2012), cardiovascular disease is the driving force behind the discrepancy in life expectancy between the indigenous groups in many countries. Much of the risk can be offset through life style changes.

Wexler et al (2012) studied that therapeutic lifestyle changes like reduced sodium diet, the DASH diet, weight loss, moderation of alcohol consumption and increased aerobic exercise is important in treatment of CHD.

Lifestyle modifications may lower the risk of any cardiovascular event and hospital readmission in people with heart disease, reported by Chiara Waur et al (2013).

3. Methodology

Coronary heart disease (CHD), also called heart disease or ischemic heart disease, result from a complex process known as arthrosclerosis (commonly called "hardening of the arteries"). In the atherosclerosis, fatty deposits (plaques) of cholesterol and other cellular waste products build up in the inner lining of the heart's arteries. This causes blockage of arteries and prevent oxygen – rich blood from reaching the heart (ischemia). There are many steps in the process leading to atherosclerosis, some not fully understood. The atherosclerosis process begins with cholesterol and sphere shape bodies called lipoprotein that transport cholesterol.

Coronary Heart Disease is still the leading causes of morbidity and mortality in the Western World, but its prognosis has improved during the past decades, in the past because of better understanding of Coronary Heart Disease underlying pathology. Researchers have identified factors, both modifiable and non- modifiable that are associated with Coronary Heart Disease risk. Much research on Coronary Heart Disease risk has focused specially on the distribution of cholesterol through different lipoproteins.

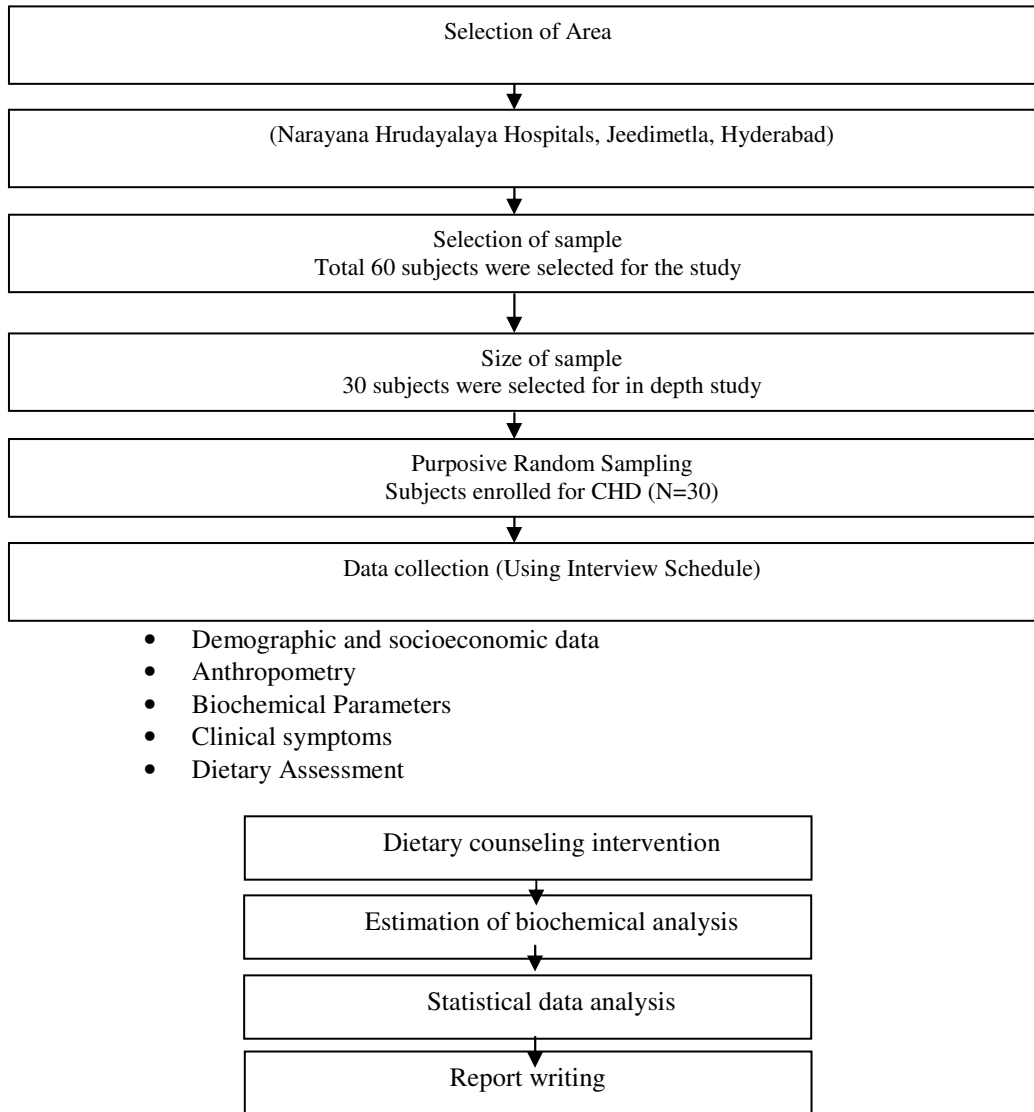
Thus Coronary Heart Disease became the epidemic that is mainly caused due to the drastic life style changes and eating habits among the developed and the developing countries. Considering all the risk factors, the increasing global trends of CHD and the importance of human health the present study was conducted at Narayana Hrudayala Hospitals, Hyderabad.

"A Study on Nutritional Status, Behavior and Lifestyle Management among Coronary Heart Disease patients and Dietary counseling"

The methodology adopted for present study was depicted under the following headings

- 3.1 Research design
- 3.2 Selection of area
- 3.3 Selection of sample
- 3.4 Size of sample
- 3.5 Tools for Data collection
 - 3.5.1 Demographic and socioeconomic data
 - 3.5.2 Anthropometry
 - 3.5.3 Biochemical assessment
 - 3.5.4 Clinical assessment
 - 3.5.5 Dietary Assessment
- 3.6 Dietary counseling
- 3.7 Statistical analysis
- 3.8 Report writing

3.1. Research Design



3.2. Selection of Area

The Coronary Heart Disease is one of the non communicable diseases which is gaining prevalence in developed and developing countries. With urbanization and economic development, a nutrition transition characterized by improvement in socio-economic status and increasingly sedentary life style have been observed, which has contributed to the increasing prevalence of Coronary Heart Disease among the adult population.

The sample for the study was selected from Narayana Hrudayalaya Hospital (NHH) Hyderabad, which was started as exclusive cardiac hospital but later got converted into a Corporate Multi-Specialty Hospital catering to various Medical and Health care needs of the people. It has a well-established cardiology department with experienced cardiology consultants. Dr. Anand Agarwal, Vice President, HOD Cardiology, NHH and Dr. Anil Kumar, Mulpur, Former Vice President, Former HOD Cardiology, NHH were consulted for selection of the sample. They have permitted to select the required sample and the data was collected under their supervision. Many subjects belonging to different age groups, lifestyle and income levels could be assessed under a single roof. It was convenient for the investigator to do an intensive research with such co-operative subjects.

3.3. Selection of Sample

Sixty subjects between the age group of 40-60 years diagnosed with coronary heart diseases were selected for the study. Only those subjects who volunteered to participate were selected randomly and included in the study.

3.4. Size of Sample

Through purposive random sampling 30 subjects with different Coronary Heart Diseases were in the study.

3.5. Tools for the Data Collection

3.5.1. Questionnaire

A questionnaire was developed to collect personal and family profile, dietary information, health problems, life style and nutritional information of CHD patients. The first section included the general information like name, class, age, date of birth, height, weight, etc. and some general questions. The second included the 24-hour dietary recall method where the respondent was supposed to fill in the food intake of the past 24 hours including the quantity and servings and food frequency questionnaire where the subjects have to fill the frequency of food items they have been taking. The importance of the physical activity and highlighted the different types of physical activities that could have been probably done by the subjects. This enabled the researcher to assess the physical activity levels of the subjects.

3.5.2. Demographic and Socioeconomic Data

Data regarding socioeconomic status like occupation, education, family size, family type, annual income and physical activity was collected by interviewing them. The responses were recorded in the questionnaire.

3.5.3. Anthropometric Assessment

Weight and height measurement were taken by following the recommended WHO anthropometric procedure (WHO 1995) scale.

A) Height

A measure tape was used to measure the height of patients. The subjects are made to stand on even floor touching the wall, the feet, parallel with heel, buttock, shoulder and back of head touch upright. The head was held comfortably erect. A smooth thin ruler was held as the top of the head in the center, crushing the hair right angle to scale and the height rod off from the lower edge of the ruler to the nearest 0.5 cm. each reading was taken twice to ensure correctness of the measurement.

B) Weight

Weight is the key anthropometric measurement, weight for the aged between 40 – 60 years is the weighing most reliable indicator of clinical nutrition. All the indicators so far developed, to assess nutritional status are mostly based on weight. The balance is placed on even floor. The weights are taken without foot wear. The subject is asked to be the center of the balance with head erect.

C) Body mass index

BMI was obtained by dividing body weight in kg by height in meter square ($Wt.(kg) / Ht (m)^2$). Nutrition status was assessed by having

- a. BMI < 18.5 were considered as underweight
- b. BMI > 18.5-24.9 as normal weight
- c. BMI 25-29.9 as over weight
- d. BMI >30 as Obese and
- e. BMI >40 as morbid obese

3.5.4. Biochemical Assessment

Under the supervision of the Dr. T.V. Chary MD, Pathologist and lab technician Mr. Ravi, Narayana Hrudayalaya Hospitals in Hyderabad, the Venous blood samples were collected from the subjects to estimate the fasting serum cholesterol, serum triglycerides, HDL and LDL Cholesterol.

The procedure for collection of the blood sample and analysis of serum lipid profile was given in Annexure – B

A) Blood Pressure

Blood pressure apparatus (Sphygmo manometer) was used to read the blood pressure of patient. The subjects are made to sit in the chair and the Blood pressure apparatus is placed besides the patient. Then the pad is tightly tide to the patient left area then the pressure is pumped with the pumper and at the same time the pulse reading was noted. In the blood pressure reading, the first figure is the systolic blood pressure and the second the diastolic blood pressure. The systolic pressures represent arterial pressure caused by the contraction of the left ventricle of the heart. The diastolic pressure is the arterial pressure when the heart is between beats or relaxation.

B) Lipid Profile Parameter

The Venous blood samples were collected from the subjects to estimate the fasting serum cholesterol, serum triglycerides, HDL and LDL Cholesterol.

3.5.4. Clinical Assessment

For clinical assessment, each patient was interviewed for the physical examination by cardiology consultants. Dr. Anand Agarwal, Vice President, HOD Cardiology and the chief complaints and associated co-morbidities were recorded on the questionnaire.

3.5.5. Dietary Assessment

For dietary assessment each patient was interviewed for the consumption of all food groups using food frequency questionnaire. The responses were recorded on the questionnaire. The frequency of foods consumed by each patient

3.6. Dietary Counseling

Periodical assessment of the patients using anthropometric, clinical, biochemical and dietary parameters is used for identifying patients who are at risk of malnutrition and hence nutrition education is given to meet their dietary needs in order to avoid any further complication and increased risk of mortality.

The Dietary improvement recommended to the people in the intervention grouped centered largely on the reduction of the salt and fats intake and increase in the intake of fruits and vegetables and fiber.

Through purpose random sampling 30 subjects diagnosed with CHD were included in the present study to assess the nutritional status data collected from them on various aspects is analyzed, tabulated and discussed in this chapter

3.7. Statistic Analysis

The data collected was coded tabulated and subjected to statistical analysis using t-test, frequency and percentage formulae.

a) T-test

$t\text{-test } Z = \bar{X} / \left(\hat{\sigma} / \sqrt{N} \right)$, where \bar{X} is the sample mean of the data, n is the sample size, and $\hat{\sigma}$ is the population standard deviation of the data.

b) Frequency

$$\bar{X} = \frac{\sum X}{N}$$

Based on the results obtained from statistical Analysis they were interpreted and discussed.

3.8. Report Writing

A report is any informational language made with the specific intention of relaying information or recounting certain events in a widely presentable form. Written reports are documents which present focused, salient content to a specific audience. A report is a prepared account of what happened, about a particular event, presented in formal and organized format backed with statistical evidence. The whole procedure of the present study undertaken had then been written under appropriate heads. The writing of a report requires skill to elevate all the aspects of the study and significance of the study in every aspect.

4. Results and Discussion

Atherosclerosis and the associated adverse complications of Coronary Heart Disease are major causes of morbidity and mortality in people living a Western lifestyle. A role for excess cholesterol in the pathophysiology of atherosclerosis is clear. However, additional mechanisms driving the relevant pathological changes in a chronic disease such as atherosclerosis are those that constitute the acute inflammatory response.

The essential elements of a physiological and regulated inflammatory response starts with stimulated endothelium, displaying adhesive molecules for circulating white blood cells. This is accompanied by localized production of cell type-specific agonists for adherent monocytes, neutrophils, or lymphocytes by the activated endothelium. These agonists then activate the migratory instruction set of adherent or rolling cells positioned to receive both adhesion- and agonist-related stimuli from activated vascular endothelial cells. Lipid oxidation products formed by virtually every vascular cell type participate in orchestrating these processes.

Through purposive random sampling 30 subjects were diagnosed with CHD and were included in the present study to assess the nutritional status behaviour & life style management. The data collected from them on various aspects is analysed, tabulated and discussed in this chapter.

- 4.1 General profile of the selected subjects
- 4.2 Age of the sample
- 4.3 Occupation of the sample
- 4.4 Economic status of the sample
- 4.5 Family size
- 4.6 Nutritional Status of subject
- 4.7 Dietary information
 - 4.7 a. food habits of selected subject
 - 4.7 b. Meal pattern
 - 4.7 c. Types of diet
 - 4.7d. frequency of eating out
 - 4.7e. frequency food intake
- 4.8 Bio chemical parameters

4.1. General Profile of the Selected Subjects

Age is one of the most important social and biological factors without which nutrition status cannot be assessed (Vijayalaxmi, 1998)

Age group (in years)	Sample size (%)
40	50
50	36.7
60	13.3

Table 1: Percentage distribution of the respondents according to the age

According Table 1, depicted percentage distribution of subjects according to the age is 50 percent of respondent aged 40 years were more prone to the Coronary Heart Disease, the age group of 50 years were also shows moderate intensity of risk of the Coronary Heart Disease, 36.7 percent CHD and the age group of 60 years were show less intensity of CHD is 13.3 percent.

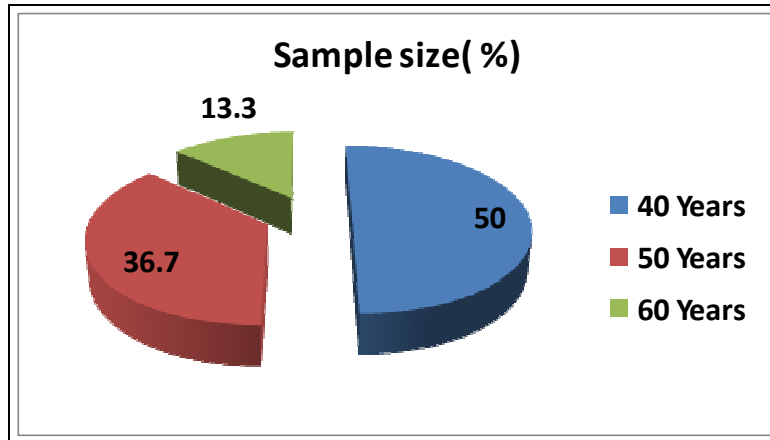


Figure 1: Distribution of respondents according to age

As age increase, heart tends not to work as well. The heart's walls may thicken and arteries may stiffen and harden, making heart less able to pump blood to the muscles of the body. Because of these changes, the risk of developing cardiovascular disease increase with age. Because of their sex hormones, women are usually protected from heart disease until menopause and than their risk increases. Pekka jousilatiet in 1998 stated that which CHD risk increase with age, but the increase is sharper in women.

S. No	Occupation	Sample size
1.	Business	13.4
2.	Govt. Employee	52.1
3.	Software Employee	22.5
4	Self Employee	12

Table 2: Percentage distribution of the respondents according to the Occupation

Table 2 percentage distribution of the respondents according to the occupation indicate majority shows the distribution of respondent of govt employee 52.1 percentage are more prone to CHD and followed by 22.5 percent of software employees.

S. No	Monthly income (Rs)	Sample size	Percentage (%)
1.	6,000 – 12,000	10	12
2.	12,000 – 18,000	55	45
3.	18,001 – 25,000	34	33
4	Above 25,000	01	10

Table 3: Percentage distribution of the respondents according to the monthly income

The Table 3 depicted the percentage distribution of the subject according to the monthly income with regard to 12 percent had monthly income between 6000-12,000, followed by a 55 percent having a monthly income of 12000 – 18000 rupees, and 33 percent had income of 18001 – 25000 rupees and 10 percent above 25000 rupees. The income level of family is above the poverty line, yet the income of majority of parents is adequate in view of urban cost of living.

S. No	Family type	Percentage
1.	Joint	33
2.	Nuclear	60
3.	Extended	7
	Total	100

Table 4: Percentage distribution of respondent according to their type of family

The table 4 shows percentage distribution of respondent according to their type of family that a good percentage of subjects had nuclear family 60 percent, followed by joint families 33 percent and extended families.7 percent.

4.2. Family Size

The number of members in a family was considered as family size.

S.no	Family Size	Percentage
1.	Less than 3	11.2
2.	4-6 members	61.5
3.	Above 6	27
	Total	100

Table 5: Percentage distribution of subjects according to their family size

The data in the Table 5 shows the percentage distribution of the subject according to the family size. It is evident majority 61.5percent and 27 percent of subjects had family size of 4-6 members and below 4 members 11.2 percent respectively.

Cooking methods	Frequency	Percentage
Frying	12	41.4
Boiling	6	20.7
Roasting	6	20.7
Steaming	4	13.8
Pressure cooking	1	3.4

Table 6: Percentage distribution of subjects according to method of cooking

This Table 6 shows percentage distribution of the type of cooking methods of the subjects. According to this table 41.4 percent are use frying method, 20.7 percent use boiling methods, 20.7 percent roasting method, 13.8 percent use steaming method and 3.4 percent pressure cooking method using. This show the frying method uses more.

Meal patterns	Frequency	Percentage
3 times	9	31.0
4 times	13	44.8
5 times	5	17.2
6 times	2	6.9

Table 7: Percentage distribution of subjects according to meal pattern

This Table 7 shows the percentage distribution of the subject according to Meal patterns of the subjects. According to this table 31 percent are eating 3 times, 44.8 percent are eating 4 times, 17.2 percent are eating 5times, and 6.9 percent eating 6 times. This show the subjects are eating 4 times meals per day.

Eating out	Frequency	Percentage
Fast foods	11	37.9
Oily foods	11	37.9
Home made	7	24.1

Table 8: Percentage distribution of subjects according to eating outside food

This Table 8 shows the percentage distribution of the subjects according to eating out side foods of the subjects. According to this table 37.9 percent are eating fast foods, 37.9 percent are eating oily foods, 24.1 percent are eating homemade, t is show subjects are eating fast foods and oily foods more.

Michael Jacobson aptly coins the phrase all outside foods or junk foods in 1972 as slang for foods of useless or no nutritive value. Their content is rich in trans fatty acids which effects the cholesterol levels and which provide high calories yet useless in value.

Types	Frequency	Percentage
Vegetarian	9	31.0
Non-vegetarian	16	55.2
Lacto –vegetarian	1	3.4
Ovo- vegetarian	3	10.3

Table 9: Percentage distribution of subjects according to types of diet

This Table 9 shows percentage distribution of the type of diet of the subjects. According to this table 31.0 percent are vegetarian, 55.2 percent are non-vegetarian, 3.4 percent are lacto-vegetarian and 10.3 percent are Ovo-vegetarian. This show the non-vegetarian percentage is high.

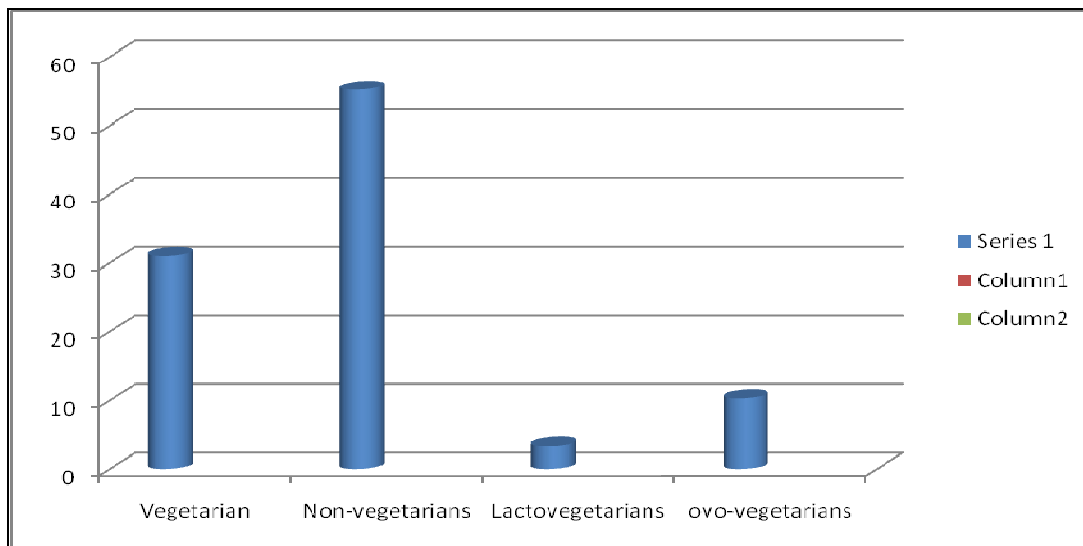


Figure 2: Distribution of respondents according to diet pattern

As it can be observed that percentage of non- vegetarian are more. This result can interpret as non- vegetarian foods are good source of cholesterol which can be a high risk factor for Coronary Heart Disease.

The researcher team was led by Stanley Hazen et al., (2013) studied that “diet high in carnitine actually shift our gut microbes composition to those that like carnitine, make meat eater even more susceptible to forming TMAO and its artery-clogging effects The study carried out by researcher at the University of Oxford, and publication in the American Journal of Clinical

	Age	Weight	Height	BMI
Mean	47.38	81.734	163.03	30.6939
N	30	30	30	30
Std Deviation	7.775	14.1903	6.271	4.76016

Table 10: Percentage distribution of subjects according to their BMI

The percentage distribution of the subjects according to mean value of the sample is depicted their age is 47.38. The average weight of the subjected is calculated as 81.374 and the average height is 163.03 according to the sample collected. So it can be observed that majority of the subject (85percent) are above than the normal BMI. This could be because of the sedentary life style, less consumption of plant foods, lack of physical activity and consumption of more trans fatty acids.

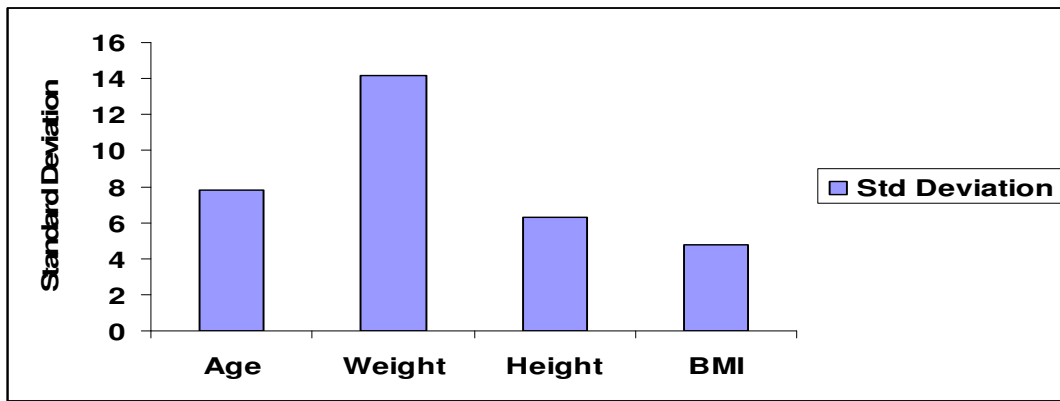


Figure 3: Standard Deviation of subjects according to their BMI

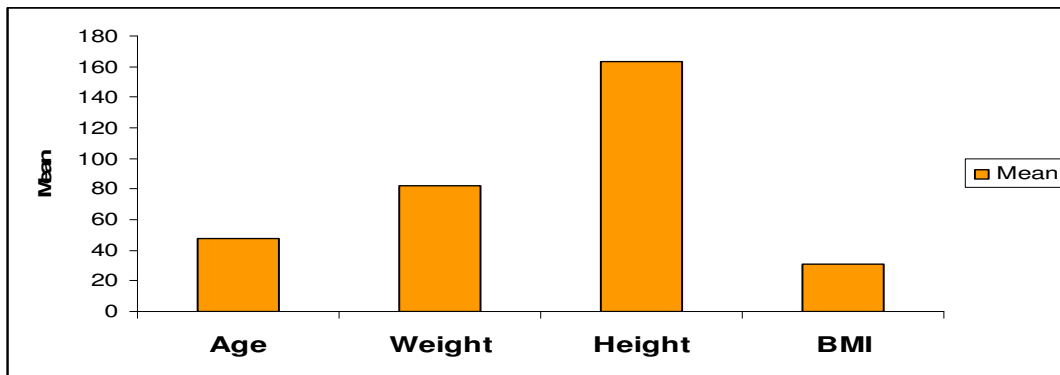


Figure 4: Percentage distribution of subjects according to their BMI

According to Jeanie Roeters Van Lennon in 2001, obesity is an independent risk factor for CHD in women as well as men. It is reasonable to postulate that in many individuals, excess weight gives rise to Diabetes, Hypertension and dyslipidaemia there by leading frank to CVD studied by Robert Eckel et., al (2006)

S. No	Symptoms	Frequency	Percentage
1.	Head ache	10	51.7
2.	Dizziness	2	6.9
3.	Impaired vision	1	3.4
4.	Shortness of breath	1	34.5
5.	Pain over the heart	-	-
6.	Un explain sweating	-	-
7.	No symptom	15	3.4

Table 11: Percentage distribution of subjects according to health issues

The distribution of subjects according to various symptoms which affect the work capacity of individuals is shown in the table. Majority of the subjects (51.7percentage reported with the symptoms headache 34.5 percent, shortness of breath, and impaired of vision show same 3.4 percentage.

Due to these clinical symptoms their physical and mental capacity which is impaired heath status of subjects

S. No	Physical activity	Sample size	Percentage
1.	Sedentary	20	61.4
2.	Moderate	9	24.6
3.	Heavy	1	10

Table 12: Percentage distribution of subjects according to their physical activity

The percentage distribution of lifestyle in the present table –12 explain that 61.4 percent of the subjects live sedentary life style in which 24.6 percent show somewhat active where they are going for walking for 30min regular and 1 percent are showing Heavy. The result where sedentary life style is associated with CHD is on par with study result of Elizabeth in 1995, which explain that physical activity is associated with an increased risk of heart disease in adults

S.no	Personal Habits	Sample size	Percentage
1.	Alcohol	13.4	4.05
2.	Smoking	52.1	15.63
3.	Tobacco	22.5	6.75
4	No personal habits	12	3.6

Table 13: Percentage Distribution of Subjects According to Personal Habits

Table 13 percentage distribution of subjects according to personal habits of the subject the above table indicate that 4.05 percent of the subject consume alcohol, 15.63 percent smoke and 6.75 percent were tobacco chewers. 3.6 percent of subjects are having no personal habit.

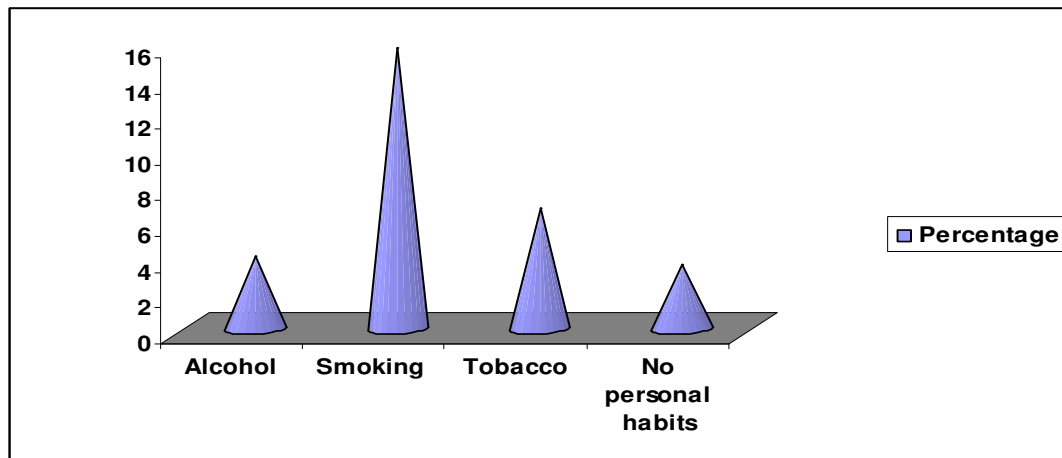


Figure 5: Percentage Distribution of Subjects According to Personal Habits

Numerous studies suggested that moderate alcohol consumption helps protect against heart disease by raising HDL cholesterol and reducing plaque accumulation in the arteries. Alcohol also has mild anticoagulation effect, keeping platelets from clumping together to form clot. Both actions can reduce risk of the heart attack but exactly how alcohol influence either one still remain unclear.

On other hand Thomas Pearson in 1996 studied that, the lowest mortality occurs in those who consume 1-2 drinks /day and those with no alcohol consumption have higher total mortality than those drinking 1-2 drinks/day

In 2001 Christine Tangney et al., reported that excessive alcohol consumption and binge drinking are the third leading cause of death in US.

According to county Sinha 2011, chewing tobacco was associated with coronary vaso-constriction.

Nancy Rigotti and Carole Clair in 2013 studied that cigarette smoking is major risk factor for CHD and leading avoidable cause of death worldwide.

S. No	Food Groups	Food items	Frequency	Percentage
1	Cereals	Rice	12	51.7
		Ragi	15	41.4
		wheat	9	31.0
2	Pulses	Soy bean	2	6.9
		Red gram	17	58.6
		Bengal gram	10	34.5
3	Vegetables	Onion stalk	4	13.8
		Plantain	6	20.7
		Drumstick leaves	8	27.6
4	Leafy vegetables	Mint	1	3.4
		Amaranth	3	10.3
		Spinach	5	17.2
5	Root & tuber	Potato	11	37.9
		Sweet potato	10	34.5
		yam	1	3.4
6	Fruits	Guava	14	48.3
		Papaya	5	17.2

		Watermelon	13	44.8
7	Non Vegetarian	Fish	9	31.0
8	Others	Groundnut	12	41.4
		Dry dates	10	34.5
		Jiggery	1	3.4
		Raisin	4	13.8

Table 14: Percentage Distribution of subjects according to frequency of food consumed

A food frequency questionnaire (FFQ) is a limited check list of food with frequency response section for subject to report how often each item was consumed over a specific period of time. From the Table14 it is evident that almost all the subject consumes more refined foods. Subjects consume less serving of fruits and vegetables. Consume less serving of leafy vegetable compared to other food groups.

Whole grains products have similar antioxidant property to that of vegetables and fruits, numerous large scale studies have found that consumption of whole grains, high fiber foods significantly reduces the risk for Coronary Heart Disease and ischemic stroke regardless of age, weight, smoking, exercise rate, alcohol intake and other factors. Lignans, a phytoestrogen that can lower the risk of Coronary Heart Disease and protect against hormonally – linked disease such as breast and prostate cancer. They are mostly found in outer layer (such as wheat bran) and are high in flax seed (linseed). Vegetables specially have antioxidants, minerals and phytochemicals in the correct combination that help keep the blood sugar in balance, create better energy in the body, and along with fruits builds up immune system. Dietary fiber is a collective term for a variety of plant substances that are resistant to digestion by human gastrointestinal enzyme. Studies have focused on soluble fiber such as oats, psyllium, pectin and guar gum and qualitative review suggested that

These fibers lower total and LDL cholesterol. Blood cholesterol is a major risk factor for coronary artery disease. Dietary intervention is the first-line of approach & increasing dietary fiber has been recommended as a safe and practical approach for cholesterol reduction and in prevention of coronary artery disease

An elevated plasma concentration of cholesterol is a risk factor for atherosclerosis. The synthesis of cholesterol in the body is increased by a high intake of saturated fats. Apart from people with a rare genetic defect in the regulation of cholesterol synthesis, dietary intake of cholesterol does not affect the plasma concentration very much as there is a normally strict control over the rate of synthesis.

		Mean	N	Std. Deviation	t-value	p-value
Pair 1	Cholesterol before	198.28	29	43.100	5.714**	0.000
	Cholesterol after	157.41	29	38.490		
Pair 2	HDL before	32.38	29	7.794	-.339**	0.000
	HDL after	42.59	29	7.229		
Pair 3	LDL before	128.76	29	35.838	7.827**	0.000
	LDL after	88.97	29	25.079		
Pair 4	Triglyceride before	204.83	29	75.516	7.311**	0.000
	Triglyceride after	134.07	29	40.683		

Table 15: Percentage distribution of subjects according to the lipid profile values

NS = Non significant

*= Significant at 5% level

** =Significant at 1% level

The results where majority of the subjects have borderline and high cholesterol could be because of the old age group. Older age is a risk factor for heart disease. In fact, about 4 of every 5 deaths due to heart disease occur in people older than 55-65.

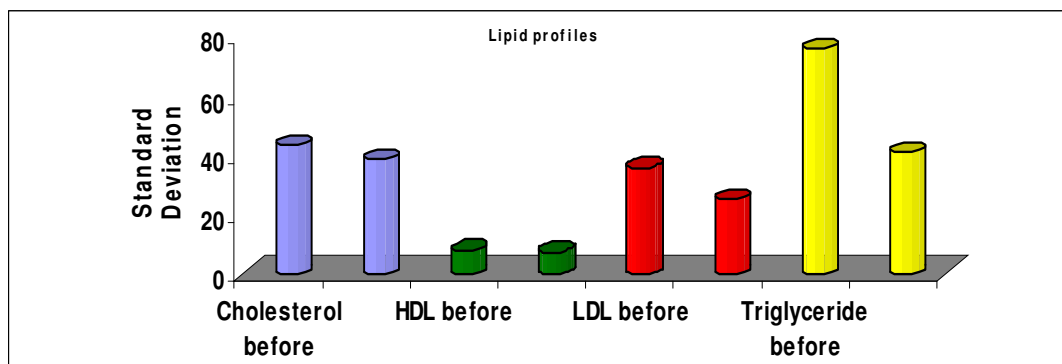


Figure 6: Distribution of Respondents according to Lipid Profiles

As age increases, heart tends not to work as well. The heart's walls may thicken and arteries may stiffen and harden, making the heart less able to pump blood to the muscles of the body. Because of these changes, the risk of developing Cardiovascular Disease increases with age. Thus the results were on par with the study results of Maria Chiara Corti et al., in 1997 where it was studied that Elevated total cholesterol level is a risk factor for death from Coronary Heart Disease in older adults.

The study par with by Jeanine Roeters Van Lennen in 2001 stated that elevated total cholesterol and LDL levels are major risk factors for CHD in both men and women.

Table 15 shows the significant percentage of distribution of lipid profile before and after nutritional education. The serum cholesterol levels before is 198.28 and after nutrition education is 157.41 which show significant at 1%, the HDL levels before is 32.38 and after nutrition education 42.59, LDL levels before is 128.76 and after 88.97 which show significant at 1% and the total triglycerides is 204.83 and after nutrition education is 134.07 which show significant at 1%

HDL is beneficial because of its ability to drive a process called "reverse cholesterol transport". HDL is something of a mop in that it helps to extract excess cholesterol deposited in blood vessel walls and deliver it back to the liver for elimination through the gastrointestinal tract. In general, higher the HDL-c greater the capacity to remove cholesterol and prevent dangerous blockages develop in the blood vessels.

The table – 15 show where the most of the subjects had low HDL-c level could be because of sedentary lifestyle, lack of physical activity, less use of combination oils, less consumption of plant based foods and whole grains. These results were on par with the study of Heukrate in 2001 where he proved the effects of low HDL level leading to increase plaque formation in the Coronary Arteries and Jeanine E Routers Van Lennen in 2001, also proved HDL levels are reported to correlate and inversely with the risk of CHD.

LDL is nicknamed "bad" cholesterol. Low-density lipoprotein cholesterol is the primary cholesterol molecule. High levels of LDL increase the risk of Coronary Heart Disease.

The table shows where most of the subjects had high and borderline LDL-c levels could be because of triple vessel disease, as majority of the subjects has more of triple blockages in blood arteries, sedentary lifestyle, less use of combination oils, less consumption of plant based foods and whole grains. These results were on par with the study of Heukrate in 2001 where he proved the effects of low HDL level leading to increase plaque formation in the Coronary Arteries and Jeanine E Routers Van Lennen in 2001, also proved HDL levels are reported to correlate and inversely with the risk of CHD.

LDL is nicknamed "bad" cholesterol. Low-density lipoprotein cholesterol is the primary cholesterol molecule. High levels of LDL increase the risk of Coronary Heart Disease.

The results where most of the subjects had high and borderline LDL-c levels could be because of triple vessel disease, as majority of the subjects has more of triple blockages in blood arteries, sedentary lifestyle, less consumption of fruits and vegetables and whole grains, less use of combination of oils, lack of physical activity, and low dietary quality score. These results were on par with the results of Emmah Leah (May 2009) where in his study he proved the association of high LDL levels as risk factors for Coronary Artery Disease.

In the human body, high levels of triglycerides in the blood stream have been linked to atherosclerosis, and by extension, the risk of Heart Disease and stroke. However, the relative negative impact of raised levels of triglycerides compared to that of LDL: HDL ratios is as yet unknown. The risk can be partly accounted by a strong inverse relationship between triglyceride level and HDL-cholesterol level. Heavy drinking puts more fat into the circulation in the body, raising the triglyceride level.

The scientific statement from the American Heart Association (2011) reviews the pivotal role of triglycerides in lipid metabolism and reaffirms that triglyceride is not directly atherogenic but represents an important biomarker of CVD risk because of its association with atherogenic remnant particles and Apo CIII.

Elevated triglycerides have been associated with an increased risk of CHD in men and women reported by Jeanine Routers van Lennep et al., in 2011.

Veronica Meade-Kelly in 2013 found those triglycerides - the fats that our bodies burn for fuel - play a causal role in Coronary Artery Disease (CAD), the most common form of heart disease and the leading cause of death in the United States.

As it is observed there is not much significant difference between the levels of vegetarians and non-vegetarians. The results showed the subjects had borderline and high triglycerides.

The collected data was tabulated and analyzed using statistical technique such as Mean, Standard deviation and 't' test. Formulas are given in Appendix -B

5. Summary and Conclusion

The nutritional behaviour determines the nutritional status of people. The nutritional behaviour or dietary behaviour is developed by people from their child hood based on their family environment and culture. The nutritional behaviour once developed continues till the end of life, unless and until the person determines to change it. There is every need to change faulty nutritional behaviour to prevent nutrition related health problems. The life style of people also influences the health. Positive life styles which include some sort of physical activity promote health. The growing health problems among women are traced back to their nutritional behaviour and lifestyle. Hence a study was under taken on "A Study on nutrition, behaviour and life style management among coronary heart disease of aged 40-60.

From Narayana Hrudayalaya Hospitals the sample was collected. In the present study 60 subjects were included through purposive random sampling. The information required for the study was collected using an oral questionnaire cum interview method. The compiled data was then grouped into sub tables and analyzed using various statistical tools like mean, percentages, standard deviation

and 't' test was applied to see the significance level of the difference between subjects of biomedical parameters. The findings are as follows

- The age group 40-60 years had a peak incidence of CHD. 45percent of subjects had normal BMI and 55percent were overweight with high BMI values.
- The serum lipid profile revealed that the non-vegetarian subjects had significantly high levels than normal value ($p>0.05$) but in case of Less physically active subjects only HDL and triglycerides showed significant difference ($p>0.05$), total cholesterol and LDL cholesterol were not statistically significant ($p<0.05$).
- The body weight of the subjects was measure using a platform type of weighing scale in order to know the error, the reading was taken thrice for five persons. There was no error hence all the subject weight was taken by making them stand erect on the weighing machine and look straight with hands hanging freely by their sides. The weight of the subjects was recorded in kilograms
- Height stand was used to assess the height of the subjects. Each subject was asked to stand each against the rod of the height stand with their back of; heels, buttock and head touching the rod. The height of each subject was measured by taking the reading corresponding to the on upper part of the rod and touching the head. The height of the subjects was recorded in meters
- A questionnaire was developed to collect personal and family profile, dietary information, health problem, life style and nutritional information.
- The investigator collected data using weighing scale, height stand and questionnaire, developed for the purpose. The data collected was coded tabulated and subjected statistical analysis using t-test, standard deviation and frequency and percentages, using the formulae.
- Life style pattern is directly associated with the risk of CHD. 50 percent of subjects' live sedentary lifestyle of which 58percent were vegetarian and 42 percent were non-vegetarian. Personal habits showed that 27 percent of subjects were alcoholic and 32 percent were smokers.
- 62 percent of the subjects were hypertensive and 46 percent of the subjects were diabetic and the results were statistically significant ($p>0.05$) for all the subjects.
- The data collected on the research topic was tabulated and analyzed using relevant statistical techniques. The result is interpreted and discussed. The major findings of the study were as follow
 1. Majority of the subjects According Table 1, 50 percent of respondent aged 40 years were more prone to the Coronary Heart Disease, the age group of 50 years were also shows moderate intensity 36.7 percent CHD and the age group of 60 years were show less intensity of 13.3 percent
 2. Table shows the distribution of respondent of govt employee 52.1 percentage are more prone to CHD and software employees 22.5 percent also more prone to CHD because of sedentary life style.
 - 3 The Table 3 depicted the percentage distribution of the subject according to the monthly income with regard to 12 percent had monthly income between 6000-12,000, followed by a 55 percent having a monthly income of 12000 – 18000 rupees, and 33 percent had income of 18001 – 25000 rupees and 10 percent above 25000 rupees. The income level of family is above the poverty line, yet the income of majority of parents is adequate in view of urban cost of living.
 - 4 The table 4 shows percentage distribution of respondent according to their type of family that a good percentage of subjects had nuclear family 60 percent, followed by joint families 33 percent and extended families.7 percent. The number of members in a family was considered as family size.
 - 5 The data in the Table 5 shows the percentage distribution of the subject according to the family size. It is evident majority 61.5 percent and 27 percent of subjects had family size of 4-6 members and below 4 members 11.2 percent respectively.
 - 6 This Table6 shows percentage distribution of the type of cooking methods of the subjects. According to this table 41.4 percent are use frying method, 20.7 percent use boiling methods, 20.7 percent roasting method, 13.8 percent use steaming method and 3.4 percent pressure cooking method using. This show the frying method uses more.
 - 7 This Table7 shows the percentage distribution of the subject according to Meal patterns of the subjects. According to this table 31 percent are eating 3 times, 44.8 percent are eating 4 times, 17.2 percent are eating 5times, and 6.9 percent eating 6 times. This show the subjects are eating 4 times meals per day.
 - 8 This Table 8 shows the percentage distribution of the subjects according to eating out side foods of the subjects. According to this table 37.9 percent are eating fast foods, 37.9 percent are eating oily foods, 24.1 percent are eating homemade, t is show subjects are eating fast foods and oily foods more.
 - 9 The percentage distribution of the subjects according to mean value of the sample is depicted their age is 47.38. The average weight of the subjected is calculated as 81.374 and the average height is 163.03 according to the sample collected. So it can be observed that majority of the subject (85percent) are above than the normal BMI. This could be because of the sedentary life style, less consumption of plant foods, lack of physical activity and consumption of more trans fatty acids
 - 10 The distribution of subjects according to various symptoms which affect the work capacity of individuals is shown in the table. Majority of the subjects 51.7 percentage reported with the symptoms headache 34.5 percent, shortness of breath, and impaired of vision show same 3.4 percentage. Due to these clinical symptoms their physical and mental capacity which is impaired heath status of subjects

- 11 The percentage distribution of lifestyle in the present table –12 explain that 61.4 percent of the subjects live sedentary life style in which 24.6 percent show somewhat active where they are going for walking for 30min regular and 1 percent are showing Heavy. The result where sedentary life style is associated with CHD is on par with study result of Elizabeth in 1995, which explain that physical activity is associated with an increased risk of heart disease in adults
- 12 Table 13 percentage distribution of subjects according to personal habits of the subject the above table indicate that 4.05 percent of the subject consume alcohol, 15.63 percent smoke and 6.75 percent were tobacco chewers. 3.6 percent of subjects are having no personal habit.
- 13 A food frequency questionnaire (FFQ) is a limited check list of food with frequency response section for subject to report how often each item was consumed over a specific period of time. From the Table 14 it is evident that almost all the subject consumes more refine foods. Subjects are consumes less serving of fruits and vegetables. Consume less serving of leafy vegetable compare to other food groups.
14. Table 15 shows the significant percentage of distribution of lipid profile before and after nutritional education. The serum cholesterol levels before is 198.28 and after nutrition education is 157.41 which show significant at 1%, the HDL levels before is 32.38 and after nutrition education 42.59, LDL levels before is 128.76 and after 88.97 which show significant at 1% and the total triglycerides is 204.83 and after nutrition education is 134.07 which show significant at 1%

5.1. Dietary Counseling

Periodical assessment of the patients using anthropometric, clinical, biochemical and dietary parameters is used for identifying patients who are at risk of malnutrition and hence nutrition education is given to meet their dietary needs in order to avoid any further complication and increased risk of mortality.

The Dietary improvement recommended to the people in the intervention grouped centered largely on the reduction of the salt and fats intake and increase in the intake of fruits and vegetables and fiber.

5.2. Conclusion

“A STUDY ON NUTRITION, BEHAVIOUR LIFESTYLE MANAGEMENT AMONG CORONARY HEART DISEASE OF AGED 40-60” conducted at corporate hospitals, allows to conclude that the nutritional status of majority of middle aged according to the BMI and dietary nutrient intake was below normal. The frequency of food intake also showed that the consumption of fruits and vegetables need to be improved. The physical activity also not varied and adequate majority of subject’s understudy consume junk foods, which is not healthy trend. The health status of subjects was determined based on the frequency of health problems; it also showed that it was poor. The nutritional status, nutritional behaviour and physical activity/ life style of subjects was not adequate it indicates that there is every need for nutrition educational intervention to change the nutritional behavior and life style of the subjects to promote good nutritional and health status.

5.3. Healthy Tips

- Include plenty of fiber, pulses, whole grains, foods made with wholegrain flour (such as wholegrain bread), and fruit and vegetables in diet.
- Stay away from food items that contain too much oil or sugar. While they do not contain extra nutrients, they surely pack in a lot of extra calories.
- Put a limit on salt intake. While salt is necessary for the body, its excessive intake proves to be quite harmful.
- Limit consumption of processed foods, which contain empty calories, saturated fats, added sugar, refined cereal grains, and additives.
- Eat lots of fresh fruits and vegetables. Rather than aerated drinks and alcoholic beverages, stick to water, juices and soups.

5.4. Limitation of the Study

Because of the sample size is small it becomes too difficult to evaluate the result from the study out comes accurately.

Any study based on survey through a pre design questionnaire suffering from basic limitation of the possibility of difference between what is recorded and what is truth, no matter how carefully the questionnaire has been designed and field investigation has been conducted.

This could be because the subject may not deliberately report their true preference and even if they want to do so, there are bound to be difference owing to problem in filters of communication process.

The time factor could be considerable limit on the scope and the extensiveness of the study. The information provided by respondents may not be fully accretes due to unavoidable biases.

5.5. Result and Discussion

Atherosclerosis and the associated adverse complication of Coronary Heart Disease are major causes of morbidity and mortality in people living a Western life style. A role for excess cholesterol in the pathophysiology of atherosclerosis is clear. However, additional mechanisms driving the relevant pathological change in a chronic disease such as atherosclerosis are those that constitute the acute inflammatory response

The essential elements of a physiological and regulated inflammatory response, starts with stimulated endothelium, displaying adhesive molecules for circulating white blood cells. This is accompanied by localized production of cell type-specific against for adherent monocytes, neutrophils, or lymphocytes by the activated endothelial cells. Lipid oxidation product formed by virtually every vascular cell type, participate in orchestrating these processes.

6. Abbreviations and Acronyms

BMI	-	Body Mass Index
BP	-	Blood Pressure
CAD	-	Coronary Artery Disease
CHD	-	Coronary Heart Disease
CVD	-	Cardio Vascular Disease
DASH (diet)	-	Dietary Approach to Stop Hypertension
FFQ	-	Food Frequency Questionnaire
HDL	-	High Density Lipoprotein
HHS	-	Health and Human Services (US)
HTN	-	Hypertension.
LDL	-	Low Density Lipoprotein
LVEF	-	Left Ventricular Ejection Fraction
NHH	-	Narayana Hrudayalaya Hospital
TMAO	-	Trimethyl amine n – Oxide
VLDL	-	Very Low Density Lipoprotein
WHO	-	World Health Organization

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Annexure

Questionnaire

➤ Personal details

Name of the respondent _____
 Age _____ sex _____
 Occupation _____
 Family size _____ family type _____
 Education status _____ income _____
 Religion _____

- 1) What is your height and weight
 Height _____ cms Weight _____ kgs
- 2) Is any one of your parents have heart problem or hypertension
 1) Mother 2) Father 3) Both 4) None

Clinical parameters

Total cholesterol	
HDL level	
LDL	
Triglycerides	
Blood pressure	

➤ Dietary Habit

- 3) What type of diet you take
 1) vegetarian 2) Non-vegetarian 3) lacto vegetarian 4) ova vegetarian
- 4) What type of cooking method are usually adopted in your home
 1) Frying 2) boiling 3) roasting 4) steaming 5) pressure cooking
- 5) What is your meal pattern daily
 1) 3 times 2) 4 times 3) 5 times 4) 6 times
- 6) Did you eat out side? if yes how frequently
 1) Daily 2) weekly 3) fortnight 4) monthly
- 7) What type of food item do you prefer
 1) Fast food 2) oily foods 3) home made foods
- 8) Do you take salty foods yes / no if yes how frequent did you take?
 1) Daily 2) weekly 3) monthly 4) yearly
- 9) Do you follow any dietary restrictions
 1) yes 2) No
- 10) Do you suffer from any of the following symptoms

Symptoms	Yes/no	Duration	Treatment received	Effect
1.Head ache				
2.Dizziness				
3.Impaired vision				
4.Shortness of breath				
5.Pain over the heart				
6.Unexplained sweating				

- 11) Do you exercise regularly? If yes

1.Type of exercise	Duration of time
2.Walking	
3.jogging	
4.Gym	
5. Yoga	
6.No activity	

- 12) Do you smoke
 1) Never 2) past 3) current 4) passive.
- 13) Are you having habit of drinking alcohol
 1) Yes 2) no

- 14) If yes how frequent do you take
 1) daily 2) weekly 3) monthly
 15) Did you feel depressed frequently
 1) yes 2) no

16) Food items preference

Food Frequency Questionnaire: Please tell the approximate amount in cup size (1. big cup, 2. medium cup, 3. small cup, our investigator will show you)/Nos/Volume in ml, for each food item you ate and also tell its frequency of consumption (investigator should write appropriate frequency codes provided below):

S. No	Food Item	Frequency	App. Qty.	S. No	Food Item	Frequency	App. Qty.
1	Plain rice (cup)			41	Butter/Cheese (tsp)		
2	Lemon Rice (cup)			42	Paneer (cups)		
3	Pulihora (cup)			43	Egg. (Nos)		
4	Fried rice (cup)			44	Omelet (Nos)		
5	Veg.Biryani (cup)			45	Non-veg biryani (cups)		
6	Puffed rice (cup)			46	Non-veg Curry (cup)		
7	Rice flakes (cup)			47	Non-veg fry (cup)		
8	Veg. Curry (cup)			48	Fish curry (Nos)		
9	Veg. Fry (cup)			49	Fish fry (Nos)		
10	Whole grams (cup)			50	Prawn/Crab fry (Nos)		
11	Dal/Sambar (cup)			51	Pickles (tsp)		
12	GlV Dal (cup)			52	Papad (Nos)		
13	GlV curry (cup)			53	Fruits (Nos)		
14	Green salad (cup)			54	Fruit juices (ml)		
15	Idly (Nos)			55	Packed fruit juices (ml)		
16	Dosa (Nos)			56	Biscuits (salt/sweet- Nos)		
17	Puri (Nos)			57	Bakery biscuits (Nos)		
18	Chapati (Nos)			58	Fried Chips (cup)		
19	Pulka (Nos)			59	Puffs (Veg/Egg)		
20	Parota (Nos)			60	Puffs (Non-veg)		
21	Stuffed parota (No)			61	Burger (Nos)		
22	Nan (Nos)			62	Pizzas (Nos)		
23	Upma (cup)			63	Cakes		
24	Vada (Nos)			64	Ice cream (ml)		
25	Dahi-Vada (Nos)			65	Noodles (cups)		
26	G.nut Chutney (tsp)			66	Pani Puri (Nos)		
27	coconut chutney (tsp)			67	Chat Items (cups)		
28	Bread (Nos)			68	Mixture/Boondhi (cup)		
29	Jam (tsp)			69	Samosa (Nos)		
30	Sauce (tsp)			70	Chocolates (Nos)		
31	Honey (tsp)			71	Sweets (Nos)		
32	Sugar (tsp)			72	Payasam (cups)		
33	Jaggery (tsp)			73	Mirchi Bajji (Nos)		
34	Tea (cup)			74	Dry fruits (gms)		
35	Coffee (cup)			75	Oats (cup)		
36	Milk (cup)			76	Cornflakes (cup)		
37	Curd (cup)			77	Other fried snacks (cup)		
38	Butter milk (cup)			78	Health drinks (tsp)		
39	Lassi (cup)			79	Soft drinks		
40	Ghee (tsp)			80	Beer (ml)		

* Frequency codes

1. Once a day, 2. Twice a day, 3. Thrice a day, 4. 2-3 days/week, 5. 4-6 days/week
 6. Once a week, 7. Once in Fortnight, 8. Once in a month, 9. Occasional, 10. Never.

Estimation of HDL Cholesterol

Reagents:

- Phosphotung state
- Magnesium chloride (Mgcl2)
- Tris buffer PH 7.6

➤ Procedure:

Add 1 ml of serum in test tube and 0.1 ml of phosphotung state and mix well for 10 seconds. Now add 0.05 ml Mgcl2 and again mix for 10-15 seconds. Immediately centrifuge for 30 minutes and separate the filtrate. The supernatant solution should be clear. If the supernatant is turbid, take 0.5ml of serum and add 0.5ml of tris buffer and repeat the above procedure. Estimate cholesterol in the supernatant.

HDL cholesterol = cholesterol concentration in supernatant × 1.125

(If the serum is diluted with tris buffer, then cholesterol value × 2.25)

➤ Reference values:

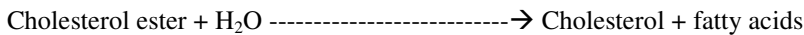
- HDL cholesterol (mg/dl)
- <40 – low desirable
- 40-60 – desirable
- >60 – highly desirable

Estimation of Total Cholesterol

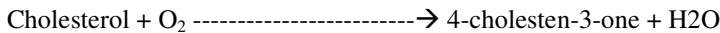
Liquid-Cholesterol (CHOD-PAP)

Principle: Enzymatic colorimetric determination of total cholesterol according to the following reactions:

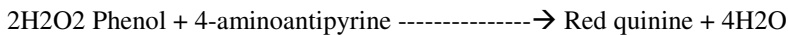
Cholesterol esterase



Cholesterol oxidase



POD



Reagents:

1. Reagent : (R1) Ready to use Liquid Stable
2. Reagent : (R2) Cholesterol Standard-200mg/dL)

Samples: Serum, Heparinized Plasma

➤ Procedure:

Preparation of Working Reagent: No working solution needs to be prepared as the reagents supplied are Ready-to-Use.

Protocol for Testing

Read against Reagent Blank

Reagent	Blank	Standard	Sample
		1ml	1ml
Distilled water	10µl		
Standard		10µl	
Sample			10µl

Mix and read the optical density (OD) after 15 minute incubation at 37°C or 10 minutes at room temperature (25-30°C)

Calculation:

OD sample

----- × n

OD standard:

(Where n is the value of cholesterol standard)

To convert cholesterol into mmol/L, divide by 38.67 (Michael et al, 2005)

➤ Reference Values:

- Total Cholesterol (mg/dl)
- <200 - Desirable
- 200-239 - Borderline risk
- ≥ 240 - High risk

Estimation of TriglyceridesGPO-PAP, End Point Assay

Principle: Triglycerides are hydrolysed by Lipoproteins Lipase (LPL) to produce Glycerol and Free Fatty Acid (FFA). In presence of Glycerol Kinase (GK), Adenosine Triphosphate (ATP). Glycerol 3-Phosphate is further oxidized by Glycerol 3-Phosphate Oxidase (GPO) to produce Dihydroxyacetone Phosphate (DAP) and H₂O₂. In presence of Peroxidase (POD), Hydrogen Peroxide couples with 4-aminoantipyrine (4-AAP) and 4-Chlorophenol to produce red Quinone mine dye. Absorbance of coloured dye is measured at 505nm and is proportional to Triglycerides concentration in the sample.

LPL

Triglycerides-----> Glycerol + FFA

GK

Glycerol + ATP -----> Glycerol 3-Phosphate + ADP

GPO

Glycerol 3-Phosphate + O₂ -----> DAP + H₂O₂

POD

2H₂O₂ + 4-AAP + 4-Chlorophenol -----> Quinoneimine + 4H₂OReagents:1. Triglyceride mono reagent

2. Triglyceride Standard

Procedure:

Pipette into tube marked	Blank	Standard	Test
Serum /Plasma	-	-	10μL
Reagent 2	-	10μL	-
Reagent 1	1000μL	1000μL	1000μL

Mix well. Incubate at 37°C for 10 minutes. Programme the analyser as per the above assay parameters

1. Blank the analyser with Reagent Blank.
2. Measure absorbance of Standard Followed by the Test.
3. Calculate results as per given calculation formula.

Calculation: Triglyceride (mg/dl) = $\frac{\text{Absorbance of test} \times 200}{\text{Absorbance of standard}}$

To convert triglyceride into mmol/L, divide by 88.57 (Michael et al, 2005)

- Reference values:
 - Triglycerides (mg/dl)
 - <150 – Normal
 - 150-199 – Borderline high
 - 200-499 –High
 - ≥500 – Very high

Estimation of VLDL & LDL Cholesterol

a) Calculation of VLDL Cholesterol:

$$\text{VLDL} = \frac{\text{Triglycerides}}{5}$$

- Reference Values:
 - VLDL Cholesterol (mg/dl)
 - <30 – Normal
 - >30 – High risk
- Calculation of LDL Cholesterol:
 - LDL = Total Cholesterol – HDL + VLDL
- Reference Values:
 - LDL Cholesterol (mg/dl)
 - <100-Optimal
 - 130-159 – Borderline high
 - 160-189- High
 - ≥190 – Very high