Type of Fats and Oils used, Physical Activity Levels, Dietary Habit and Lipid Profile of Coronary Artery Subjects

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Abstract

Dietary fats comprise of saturated and unsaturated fats. High consumption of saturated fats is implicated in coronary artery diseases. With this background the current research work was envisaged with an intention of knowing the type of fats and oils consumed by CAD subjects, as dietary fats and oils are the vehicle for saturated and unsaturated fatty acids in our diet. The polyunsaturated fatty acids especially omega 3 has shown cholesterol lowering action therefore encouraged to be consumed by CAD subjects. This study was conducted to identity the consumption pattern of fats and oils rich in omega 3 fatty acids. The results show that the majority of cardiac subjects neither consumed or were aware of nutritional benefits of omega fatty acids. Lipid profile was collected to know the lipid profile of the subjects and it showed that majority of subjects were dyslipidemic.

Keywords: CAD; Fats; Oils; Omega-3; Omega-6.

INTRODUCTION

Cardiovascular disease (CVD) is a cluster of diseases including atherosclerosis,

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hypertension, ischemic heart disease, peripheral vascular disease, heart failure (HF) and injuries that affect the cardiovascular system (the heart and blood vessels). These diseases are interrelated and often coexist. Coronary heart disease (CHD), also called coronary artery disease (CAD) and atherosclerotic heart disease, is the end result of the accumulation of atheromatous plaques within the walls of the arteries that supply the myocardium (the muscle of the heart). Coronary artery disease (CAD) accounts for approximately 610,000 deaths annually (estimated 1 in 4 deaths) and is the leading cause of mortality in the United States. It is the third leading cause of mortality worldwide and is associated with 17.8 million deaths annually.[1]

As India is undergoing an epidemiologic transition *i.e.*, the burden of communicable diseases is on a decline whereas there is considerable

increase in non-communicable diseases (NCD). In the past 40 years India has seen a 4 fold rise in CHD prevalence and it was reported by Global Burden of Diseases Study that 5.6 million in men and 4.5 million in women disability adjusted life years due to CHD in 1990, whereas it was projected to be 14.4 million and 7.7 million in men and women respectively by 2020.[2]

High blood pressure, high blood cholesterol, smoking, obesity, diabetes, physical inactivity[3] and inflammation[4] are major risk factors. Another key risk factor often overlooked is nutrition, like poor dietary choice *i.e.*, increased consumption of highly processed carbohydrates, high consumption of saturated fat and red meat have a direct effect on fat concentrations in the body (increasing the risk of high LDL cholesterol and obesity). A skewed ratio between omega 3 and omega 6 ratio in the diet is another leading cause for CAD.[5] Studies on the quantity and quality of cooking oil and omega 3 fatty acids consumed by population are, therefore, needed to understand their association and role in CAD occurrence, prevalence and progression.

In this paper, we report on the usage of different types of fats and oils consumed by CAD patients along with physical activity levels and eating habits.

MATERIAL & METHODS

The investigation is a prospective clinical study conducted in Mysuru, a major city in the state of Karnataka. The study was carried out with an interest to collect data on the type of fats and oils by cardiac subjects. The study was carried out at the cardiology department of Sri Jayadeva Institute of cardiovascular sciences and research Hospital, Mysuru. The sample size was n=50, comprising of 28 male and 22 female patients, aged between 20 to 60 years.

All the selected participants were screened for nutritional status, dietary patterns and clinical and biochemical features. And other relevant demographic information was also obtained.

Inclusion Criteria

Patients with coronary artery disease along with the co morbid factors such as diabetes, thyroid problem and hypertension who underwent either procedure or bypass graft.

Exclusion criteria

Patients with communicable diseases were excluded.

Informed consent

A written informed consent was obtained from the subjects before the commencement of the study.

Tools used to conduct the study

A self-reporting questionnaire was developed that captured demographic profile, anthropometric measurements viz., height and weight, physical activity levels, dietary pattern, fat/oils consumed. Medical history and biochemical parameters were secondary data and obtained from the subject's hospital files.

Compilation and Statistical Analysis

The data so obtained was tabulated and subjected to suitable statistical analysis like descriptive analysis to describe the characteristics of the population and clinical parameters studied.

RESULT & DISCUSSION

Demographic Profile

Demographic profile comprises information on, gender, race and ethnicity, socioeconomic background, and age. These factors determine the type and quantity of oil consumed for e.g., in northern, north eastern region people mostly use mustard oil whereas southern part of the country people prefer coconut, peanut and sunflower oil. Table 1 shows the gender and age category of the patients. Age and gender play a role in determining CVD risk factors. Incidence of CVD is more in men compared to women.[6] The dietary pattern showed that 86% were vegetarians and research has shown that plant based diet is beneficial in preventing cardiovascular diseases and rest 16% were non-vegetarian. High consumption of red meat is a risk factor for CVD's as it is high in saturated fats. 84% of the patients were Hindu's and 16% were Muslims. Most of the patients were from urban area 58% and the rest 42% were from semiurban area. The geographical area that a populationlives in, determines ones eating habit and food choices though this has become less significant due to globalization.

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Table 1: Gender and age profile of the CAD subjects

Gender (n=50)	Number
Male (28)	
Young adults (17-30)	01
Middle aged adults (31-45)	06
Old - aged adults (above 45)	21
Female (22)	
Young adults (17-30)	Nil
Middle aged adults (31-45)	08
Old - aged adults (above 45)	14

Anthropometric and physical activity

BMI index relates indirectly to fat mass which is a risk factor for various lifestyle associated diseases like obesity, diabetes and CVD. Having higher BMI *i.e.*, <23 is associated with an increased risk of cardiovascular disease (CVD) and physical activity is a vital determinant of BMI and regular physical activity reduces the risk associated with overweight and obesity like metabolic syndrome. The Rotterdam Study a prospective cohort study, conducted in 5344 participants aged 55 years or older concluded that participants with high BMI and low physical activity had a higher risk of CVD than participants with normal weight and high physical activity.[7] From table 2 it can be observed that 46% of male and 23% of female subjects fell under the category of pre-obese. No male subject

was obese however 13% of female subjects were obese.

Table 2: BMI of CAD subjects

BMI Category	Male (%)	Female (%)
Underweight (<18.5)	7	9
Normal (18.5-22.9)	36	23
Overweight (23-24.9)	11	32
Pre-obese (25-29.9)	46	23
Obese (30-39.9)	-	13

Lipid profile of the subjects

Lipids are energy dense macronutrients that have vital role in biological system like being part of cell membrane and lipid panel test in serum is done to ascertain the quantity and type of lipid in blood which is correlated to heart health. Lipid molecules like triglyceride, low density lipoprotein, high density lipoproteins, cholesterol are the molecules that are tested among which high triglyceride and low density lipoproteins are a major risk factor for CAD.

Fig. 1 depicts the lipid profile of the subjects studied. LDL levels were high in 29% of the male subjects compared to 27% of female subjects, similarly 29% of male subjects had higher TG levels compared to female subjects (18%). High LDL and TG levels are a strong indicator of CAD.
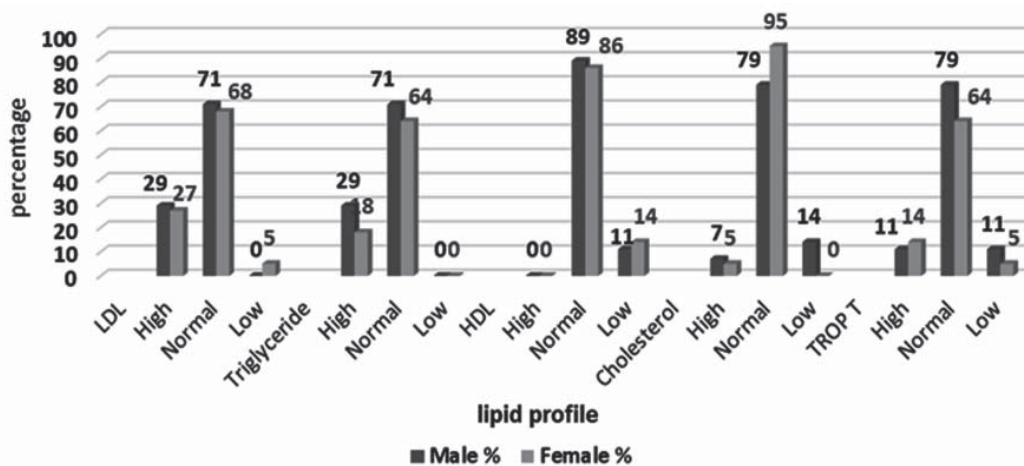

Fig. 1: Lipid profile of the subjects

Hight triglyceride is a strong indicator of CAD, lipids present in food are in the form of TG and it is also the form in which it is stored in human system. TG are made of three fatty acids attached to one glycerol molecule and the fatty acids can be saturated or unsaturated depending on the presence or absence of double bonds. 29% of the

male subjects and 18% of the female subjects had high TG levels with rest having normal TG levels which could be attributed to the medications. HDL or high density lipoproteins which is considered good cholesterol as it helps in excretion of fats from the body was normal in 89% of male and 86% of female subjects.

Cholesterol was normal in 79 and 95% of the male and female patients respectively. Cholesterol is synthesized in the human body and is present in animal source food. It is an important component of cellular membrane, hormones and is vital for many biological functions.

There are certain limitations to the standard biochemical markers of cardiac damage due to acute coronary events in terms of sensitivity therefore a constant need for search of more accurate markers.[8] Troponins are a type of proteins found in heart muscles and troponin T (cTnT) and troponin I (cTnI) help regulate calcium mediated interaction between actin and myosin.[9]

These proteins are released upon heart muscle damage andmore sensitive and specific. They are considered superior indicators of myocardial necrosis compared to creatine kinase MB (CK-MB).[10] 11% and 14% of the male and female CAD patients had high levels of TROP T respectively.

Lifestyle factors

Red meat based diet is a major risk factor for CVD compared to a balanced plant based diets. 86% of both male and female CAD patients were non-vegetarian (Table 3).

Table 3: Life style factors of the subjects

Lifestyle Factoes		Male (%) (n=28)	Female (n=22)
Diet	Vegetarian	14.2	13.6
	Non-vegetarian	85.7	86.4
Smoking		75	9.1
Alcohol		17.8	4.5
Physical Activity (walking)		67.8	54.5

Cox proportional hazard model was used to study the relationship between a plant based diet and risk of cardiovascular disease in 123 330 postmenopausal women initially free of CVD in the Women's Health Initiative from 1993 through 2017. The study showed that higher adherence to the Portfolio Diet *i.e.*, combinations of cholesterol-lowering foods in one diet was associated reduced incident of cardiovascular and coronary events, as well as heart failure.[11] Smoking and alcohol are major risk factors for CAD. It was observed from the data collected on smoking and alcohol consumption that more men smoked and had alcohol compared to women patients. 75% male subjects smoked compared to 9.1% female subjects and 17.5% male subjects consumed alcohol in comparison to 4.5% female subject (Table 3). A population based cohort study was conducted in China among 66,743

Chinese men aged 30–89 in Shanghai, recruited from 1996 to 2000 to study the joint effect of cigarette smoking and alcohol consumption on mortality showed that heavy drinkers and smokers had the highest mortality.[12] From the data collected it was observed that male (67.8%) was involved in physical activity compared to 54.5% of females. Physical activity levels are one of the deciding factors of an individual's (BMI) as well. A study conducted in 55 adults to investigate the impact of physical activity (PA) on adiposity and forcardiovascular and metabolic disease risk markers (CMDRMs) showed that body composition and PA intensity play an independent yet an integrated role in CMDRMs. The study further showed that vigorous activity improved blood lipids profile such as high density lipoproteins (HDL), low density lipoproteins (LDL), and arachidonic Acid (ARA)/eicosapentaenoic acid (EPA) ratio and that participants with low PA levels were more likely to have higher levels of leptin and high sensitivity C-reactive protein (hs-CRP).[13]

Dietary fats and Oils Preference

Dietary fats and oils are made of triglycerides comprising of a glycerol molecule attached to 3 fatty acids. The fatty acids can be saturated or unsaturated. Polyunsaturated fatty acids especially omega-3 fatty acids have preventive as well as used in management of CAD.

Milk and milk products, red meat, coconut oil, palm oil, processed foods like ice cream, chocolate, margarine or sandwich spreads, nuts etc., are some sources of saturated fat in the human diet. Saturated fatty acids (SFA) are a strong risk factor for CVD as they increase low density lipoprotein (LDL) cholesterol which leads to plaque formation.[14]

Fig. 2 depicts the fat and oil preference of CAD subjects. Majority of the patients both male and female, consumed sunflower oil, butter and ghee. Sunflower oil (Helianthus annuus L.) is made up of 15% saturated, 85% unsaturated fatty acid.
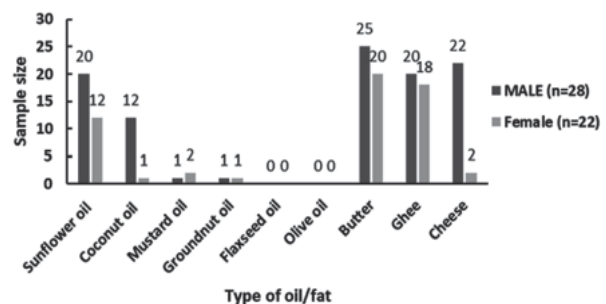

Fig 2: Type of fat and oil consumed by CAD subjects

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The unsaturated fatty acid consists of 14-43% oleic and 44–75% linoleic acids (omega–6 fatty acid)[15] which is a parent compounds for arachidonic acid (20:4ω6), is produced in excess can lead to inflammation, chronic disease and cancer.[16] Whereas, oleic acid is a mono-unsaturated omega-9 fatty acid which is a major component of olive oil and has hypotensive or blood pressure reducing effects.[17] On the other hand, majorly butter comprises of oleic acid (approx. 19%) and palmitic acid (approx. 21%). Palmitic acid is a saturated fatty acid present in meat, butter, palm oil and is synthesized endogenously making up the membrane phospholipids and triacylglycerols of adipocytes. It was also noted from the data that none of the participants consumed olive or flax seed oil. Olive oil is not native to India and also not quite suitable for Indian cooking, however it was interesting to note that flax seed in spite of being one of the richest and economical sources of both α-linolenic acid (ALA), phytoestrogen, lignans, as well as soluble fiber, all of which have proven evidence to reduce serum low-density lipoprotein cholesterol concentrations and reduce postprandial glucose absorption was not consumed by any of the subjects. The subjects were not on any omega–3 supplements as well.

CONCLUSION

Omega-3 and omega-6 compete for the same enzymes in their metabolic pathways hence the levels in our diet may influence each other. Fats and oils used in daily cooking are the sources of these unsaturated fatty acids. Omega-3 fatty acids have long been proven to have anti-inflammatory, and cardioprotective functions. Omega-6 is leads to arachidonic acid (AA) which is a precursor for pro-inflammatory and tumour markers. Therefore, it becomes vital to know the source and amount of omega-3 and omega-6 consumptions among population.

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