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NUTRITION PROFILE OF SELECTED CARDIOVASCULAR PATIENTS AND EFFECT OF POMEGRANATE JUICE SUPPLEMENTATION

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Introduction

Cardiovascular disease (CVD) is a general term for all diseases of heart and blood. Cardiovascular disease is a complex and multifactorial disease. In India, the death rate of cardiovascular diseases is increasing at an alarming rate and is estimated currently as 52 per cent (Gupta,2001). About one-fourth of these deaths occur among people below the age of 45 years. At present, atleast 30 million people are suffering from heart disease in India, which is expected to become 100 million by the year 2010 (Gambhir, 2000) . Modification in obesity, intake of dietary fat, exercise habits and control of cholesterol level, hypertension, smoking, alcohol intake and stress will reduce the risk of CVD(Hakajima,2000).

Foods that provide health benefits beyond those of the traditional foods are called functional foods. Functional foods may be more useful for prevention of mild cases of heart disease than for intervention and more severe cases. WHO (1997) emphasis on health expectancy rather than life expectancy. In this ongoing quest to find new supplements to lead longer and healthier lives, science often returns to things that have been used regularly for thousands of years. A case in point is the pomegranate.

Pomegranate is a rich source of folic acid, antioxidants and polyphenols. The polyphenols in pomegranate are found to lower blood pressure, cholesterol, reduce lipid peroxidation, cellular cholesterol accumulation and development of arteriosclerosis . Thus pomegranate juice has become heart healthy these days. Hence the present study has been undertaken to identify the cardiovascular patients, assess the health and nutritional status of the hyperlipedemic subjects and study the effect of pomegranate juice supplementation on the selected hyperlipidemics.

Methodology

Two private hospitals with well-established cardiovascular departments were selected in Coimbatore city for the conduct of the study. Initially, 150 cardiovascular patients both male and female between 45 and 65 years of age were selected by quota sampling. From this a sub sample of 40 hyperlipedemic subjects, with secondary activity having borderline high risk of serum lipid profile level were selected.

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They were divided into two groups of 20 each experimental (E1, E2) and control (C1, C2) groups. Each group consisted of seven women and three men, totally 10 subjects with medication and 10 subjects without medication. The investigator interviewed them to collect information on the socio-economic background, lifestyle and dietary pattern.

After the collection of data, 180ml of pomegranate juice was supplemented for a period of three months to the experimental group consisting of 10 hyperlipedemic subjects with medication (E1) and 10 subjects without medication (E2). To determine the impact of supplementation, anthropometric measurements, blood pressure and biochemical parameters including serum cholesterol, serum triglyceride, HDL cholesterol, LDL cholesterol and VLDL cholesterol were assessed before and after the supplementation.

Results and discussion

Socio-economic background of the selected cardiovascular patients

In the present study 55 per cent were males and 45 per cent were females. Among the 150 subjects surveyed, majority were in the age group of 60- 65 years (40%), Hindus (91%) and were in nuclear family system (67%). Among the women and men only three per cent and two percent were postgraduates respectively and the rest were graduates (19% male and 5% female) and completed school education (28% male and 29% female).

Regarding the occupational status of men, majority of the subjects (18%) were retired, 14 per cent were in business and 75 per cent of women were housewives which shows that majority of the subjects were leading a sedentary lifestyle. Forty four per cent of the subjects belonged to high income. The prevalence of CVD was higher in high and middle-income group than low income group. It is noted that 41 per cent of the selected subjects spent Rs.2000 - 3000 per month on food.

Dietary pattern and lifestyle pattern of the subjects

Among the cardiovascular subjects surveyed, 67 percent were non-vegetarians. All the subjects followed three-meal pattern. Majority of the subjects (66%) curtailed the habit of eating outside after the onset of cardiovascular disease.

The awareness on the benefit of using combination of oils made the subjects consume refined oil and gingelly oil (17 %) and sunflower oil and gingelly oil (12%). Majority of the subjects (65%) consumed more than 10 g of oil per day. The type of hydrogenated fat consumed by the subjects is indicated in Table 1.

Table 1. Intake of fat by the selected cardiovascular patients

Type of fat consumed	Number	Per cent
Vanaspathi	24	16
Butter	14	9
Ghee	35	23
Vanaspathi + Ghee	13	9
Vanaspathi + Butter	18	12
Vanaspathi + Ghee + Butter	6	4
Refined oil	40	27

It is interesting to note that 27 percent of the subjects did not use any type of hydrogenated fat while cooking. A majority of 85 percent of subjects consumed chicken once in a week percent consumed chicken once in a week whereas mutton was consumed by 58 percent. In general, the salt and sugar intake were high among the subjects and 37 percent and 77 per cent of the subjects consumed 20 grams of salt and more than 10 grams of sugar respectively per day. Tea was consumed by majority of the members when compared to coffee. Thirty seven subjects consumed more than 200ml of tea.

Thirty four per cent of the males had the habit of consuming alcohol. More than two pegs were consumed by 54 per cent of the subjects. Information regarding the smoking pattern of the subjects is given in Table 2.

Table 2. Smoking pattern of the cardiovascular patients

Smoking pattern	Number	Per cent
Number of cigarettes smoked per day		
< 5	6	7
5 - 10	14	17
> 10	34	42
Nil	28	34
Duration (years of smoking)		
< 30	13	42
30	22	55
> 30	19	37

Thirty four per cent of the men were non-smokers. But among students 42 percent smoked above 10 cigrattes per day while 34 percent smoked above 10 cigarettes and 17 percent 5-10 cigarettes per day. Above half of them (55%) had the habit of smoking for the past 30 years while 42 percent smoked less than 30 years and 37 percent above 30 years. It was found that 53 per cent of the subjects had the habit of doing exercise for about half an hour to one hour. A majority of 51 per cent comprising 27 per cent male and 24 per cent female subjects went for walk once in a day. Family strees was observed among 43 per cent of the subjects. Stress decreases blood flow to heart, which may worsen conditions of coronary artery disease.

Health status of the subjects

It is observed that the onset of the disease was between 51-60 years and 60 -65 years of age among 19 percent of female and 29 percent of male subjects respectively. In females the cardiovascular risk was more after the age of 55 years, once they attained menopause. The familial history of cardiovascular disease was seen in 57 per cent of the subjects among whom 83 per cent hed raternal family tendency.

A majority of 122 subjects experienced chest pain. All the symptoms were almost similar in both male and female subjects except dyspnea, which was mostly observed in male and oedema and sweating in females The various health problems diagnosed in the subjects are given in Table 3.

Table 3. Health problems of the cardiovascular patients

Diagnosed condition*	Male	Female	Total
Hypertension	51	52	103
Coronary artery disease	35	17	52
Left ventricular dysfunction	24	20	44
Valve stenosis	11	14	25
Myocardial infarction	16	7	23
Congestive heart failure	8	12	20
Acute coronary syndrome	8	11	19
Dyslipidemia	5	7	12
Stroke	2	3	5
Others	10	10	20

* Multiple response

Coronary artery disease left ventricular dysfunction and myocardial infarction were the problems experienced by more subjects, whereas females had valvestenosis, ischemia and congestive heart failure in addition to the above mentioned problems. Hypertension was observed in more than half of the sample followed by coronary artery disease (CAD) A majority of 43 per cent had diabetes mellitus as co-existing disease. Pulmonary and kidney diseases had been noticed in 16 per cent and four per cent respectively. According to Garrow's classification both the male and female were under grade I obesity based on BMI. But in contrast to BMI grading, the mean waist to hip ratio of both male and female was below the NFI standards. The mean serum lipid profile of all the selected subjects is shown in the Table 4.

Table 4. Mean serum lipid profile of the subjects

(N=150)

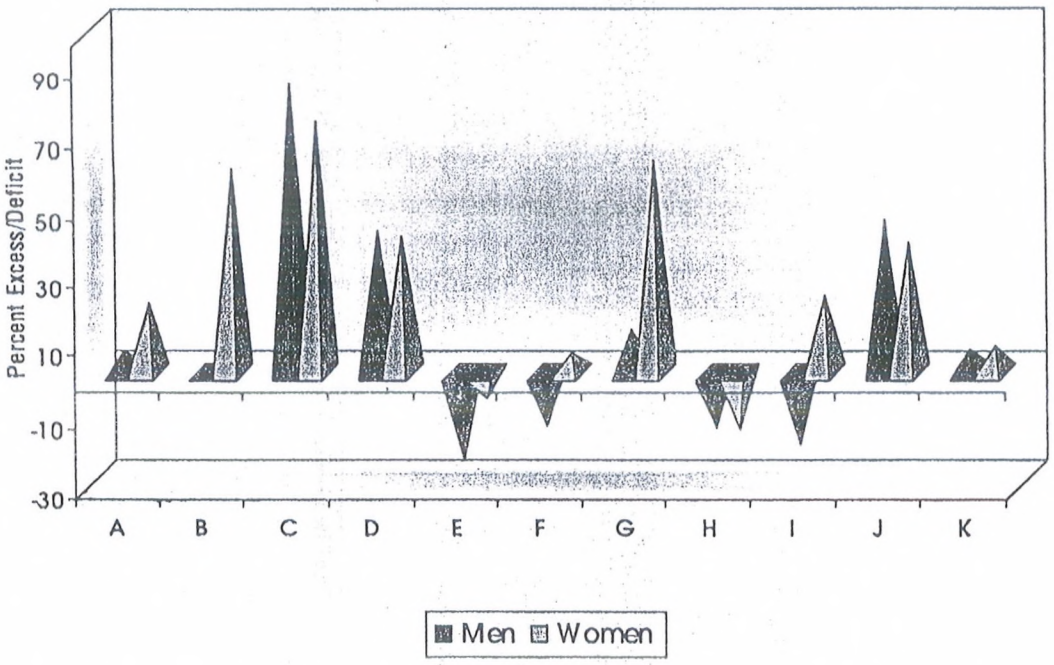
Serum lipid profile (mg/dl)	Standards		Male (N=82) Mean ± SD	Female (N=68) Mean ± SD
	Male	Female		
Total cholesterol	< 200*	< 200*	230.61 ± 8.30	239.6 ± 22.90
Serum triglycerides	< 150*	< 150*	34.38 ± 3.43	34.57 ± 8.03
HDL cholesterol	35 - 70*	35 - 70*	165.8 ± 29.31	170.59 ± 17.15
LDL cholesterol	< 150*	< 150*	30.66 ± 2.86	35.46 ± 7.48
VLDL cholesterol	20 - 60*	20 - 60*	153.36 ± 14.31	177.42 ± 37.23

The mean serum cholesterol level of the subjects was found to be elevated beyond the desirable levels of < 200 mg/dl suggested by National Cholestrol Educational Programme (NCEP). Adults with total cholesterol level from 200 to 239 mg/dl were considered were at borderline high risk. It is was observed that the blood pressure was above the normal level 0623 and 240 mm of Hg in both male and female respectively. Females subjects

had higher level of total cholesterol, serum triglycerides, HDL, LDL and VLDL cholesterol than the males.

Nutritional status of the hyperlipidemic subjects selected for supplementation study

Among the male subjects, deficits were observed in the intake of cereals, green leafy vegetables, roots and tubers, other vegetables, fruits, milk and milk products and meat / fish / poultry (8.3, 30, 8.5, 17, 27, 32.7, 46% respectively). There was an increased consumption of pulses (50%), fats and oils (50%) and sugar and jaggery (20%). Among the female subjects, deficits were observed in the consumption of cereals, green leafy vegetables, fruits, milk and milk products, meat / fish / poultry and sugar and jaggery (23.7, 25, 26, 29, 31, 34, 54, 10% respectively). Increased consumption of pulses (36.7%) and fats and oils (65%) was observed in the selected hyperlipidemic subjects. The mean nutrient intake of the hyperlipidemic subjects is given in Figure 1.



A. Energy B. Protein C. Fat D. Calcium
E. Iron F. Beta carotene G. Thiamine H. Riboflavin
I. Niacin J. Ascorbic acid K. Folic acid

Figure 1. Mean nutritent intake of the hyperlipidemic subjects

The mean intake of energy, fat, calcium, thiamine, ascorbic acid and folic acid were above the ICMR recommended daily allowance (RDA). Among males and the intake of other nutrients like protein, iron, beta–carotene, riboflavin and niacin were below the RDA levels.

The mean nutrient intake of energy, protein, fat, calcium, beta–carotene, thiamine,

niacin, ascorbic acid and folic acid were more than the ICMR recommended allowances in females. Deficits were seen only in iron and riboflavin.

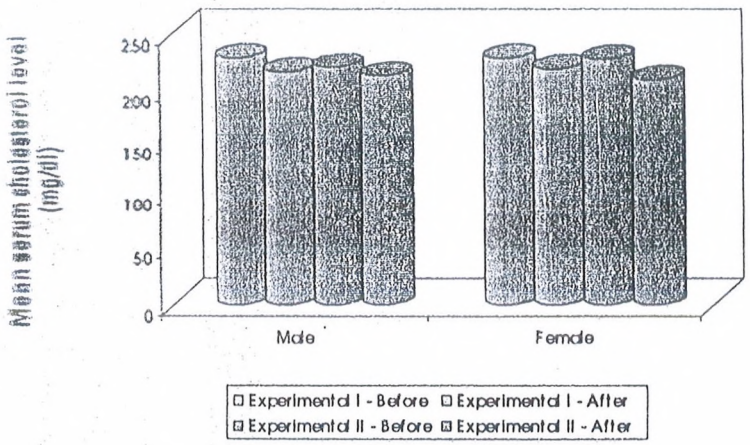


Figure 2
Mean serum cholesterol level of the selected hyperlipidemic subjects

Effect of pomegranate juice supplementation on the selected hyperlipidemic subjects

The total antioxidant content in 180 ml of pomegranate juice was analysed and found to be 71.28 mg/dl of antioxidants as per frap method.

In the supplementation study there was a slight decrease in the weight and BMI of both the experimental groups after supplementation. Figure 2 gives the mean serum cholesterol levels of the subjects before and after supplementation.

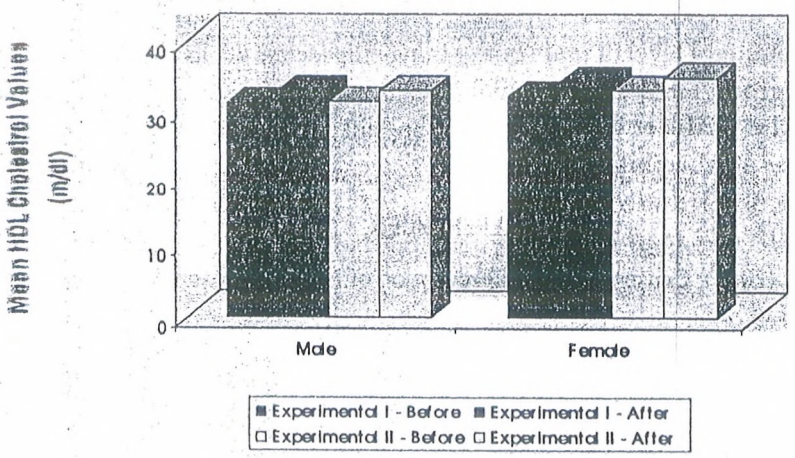


Figure 3
Effect of supplementation on the HDL cholesterol levels of hyperlipidemics

In the case of experimental group II (without medication) it was found that total serum cholesterol level decreased in both male and felame significantly ($p<0.01$) in comparison with the respective control group (C2). The mean difference was found to be more in experimental group I among men and in experimental group II among female. Among female, a slight increase in the serum triglyceride level was observed. Figure 3 shows the effect of supplementation of pomegranate juice on serum HDL cholesterol levels of the hyperlipidemic subjects.

With regard to the serum HDL cholesterol level of the subjects, there was an increase in the mean HDL level in both male and female. There was a reduction in serum LDL cholesterol in both male and female in both experimental group I and experimental group II. Pomegranate juice appears to increase the activity of paraoxonase (PON) enzyme by 30 per cent in patients with high cholesterol and diabetes. This ability to enhance PON activity stimulates HDL and reduces the LDL oxidation thereby reducing the progression of atherosclerosis (Miguel, 2005). There was a slight decrease in the serum VLDL cholesterol level of male both in experimental group I and experimental group II but the difference was not statistically significant. Among female, both in E_1 and E_2 there was a slight increase in the serum VLDL-cholesterol levels. A very slight reduction in the systolic pressure of the subjects was observed after the supplementation of pomegranate juice in both males and females in both the experimental groups. There was no change with regard to the diastolic pressure of the subjects at the end of the supplementation

Conclusion

Elevated level of serum cholesterol is found to be one of the causes for the cardiovascular disease. Changes brought about in the lipid profile would improve the quality of life of the people and keep them at bay from this life threatening disease. From the results of the study, it can be concluded that use of pomegranate juice is beneficial in reducing the serum lipid levels especially the serum cholesterol and it also increases the HDL, which is the good cholesterol and hence can be used to prevent chronic degenerative diseases, as the present emphasis of people is on prevention is better than cure. The impact of pomegranate juice is not only on hyperlipedemic but its effects on other diseases like hypertension, diabetes mellitus and cancer are still under research.

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