

Efficacy of Multiple Dietary Therapies in Reducing Risk Factors for Coronary Heart Disease

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INTRODUCTION

Appropriate and balanced diet does have major role in curbing the menace of serious ailments spreading in epidemic forms in the world. Disease or dis-ease of the heart has reached to the alarming proportions causing untimely deaths in a colossal way. By adopting a prudent diet of foods like garlic, onion, tomato, *amla*, *alsi*, fruits and vegetables etc. the extent and severity of risks associated with coronary heart disease can be reduced to a large extent. This can also prevent injury and fat deposition and hence these are cardioprotective foods. Strategies based on dietary modifications, if implemented can decrease the morbidity associated with disease of heart and blood vessels and bring about regression of the pathological process. Usually dietary modifications is the first line of treatment and drug treatment follows only if there is an inadequate response to diet. Counselling results in noteworthy changes in food adjustments, in food preparation practices, increase in healthy food adjustments and beverage choices. Therefore the present study was an attempt to examine the efficacy of some common cardioprotective foods on the health of the subjects in reducing the risk factors associated with coronary heart disease (CHD).

MATERIALS AND METHODS

Thirty-five male subjects aged 20-49 years, who were at risk of coronary heart disease (CHD), belonging to the same professional class (legal profession) from Ludhiana city, Punjab who were engaged in their daily work for an average of 6 to 10 hours were chosen for the study. A well-constructed, pre-tested questionnaire was used for conducting the interview schedule for collection of the information on various aspects such as background information, occupation and life style, dietary pattern etc. Analysis of clinical and lipid profile was carried out. Systolic and diastolic blood pressure, low density lipoprotein-

cholesterol (LDL-C), very low density lipoprotein - cholesterol (VLDL-C), high density lipoprotein - cholesterol (HDL-C), total triglycerides were carried out by standard methods. The subjects were advised to include garlic (*Allium sativum*) 6 g/day, onion (*Allium cepa vercepa*) 50g/day, tomato (*Lycopersicon esculentum*) 200g/day, *amla* (*Phyllanthus emblica*) 100g/day and *alsi* (*Linum usitatissimum*) 2.5 g/day for a period of 4 months.

The nutrient analysis of the *se* foods was also carried out by computer programme 'MSU' Nutriguide (Song et al., 1992) (Table 1).

Table 1: Nutrient analysis of the cardioprotective foods recommended

Calories	163 kcal
Proteins	5 g
Carbohydrates	31 g
Total fat	2 g
Polyunsaturated fatty acids (PUFA)	1 g
Saturated fatty acids (SFA)	0 g
Ascorbic acid	556 mg
β -Carotene	603.8 mg
Sodium	33 mg

Nutrition knowledge of the subjects was tested and based upon their test scores nutrition education was given to all the subjects for a period of 4 months after which the nutrition knowledge was again tested and improvement in test scores noted. Data were statistically analysed on various aspects using the paired 't' test.

RESULTS AND DISCUSSION

The general information (Table 2) revealed that most of the subjects at risk of coronary heart disease (CHD) were between 40-49 years of age, belonged to a high income group with no or very little physical activity, a high tendency for cigarette smoking and alcohol consumption and had a family history of heart attacks, hypertension or obesity. The major contributing risk factors for CHD among the subjects were hypertension, followed by hypercholesterolemia and obesity.

After 4 months of providing nutrition education to the subjects, the daily nutrient intake (Table 3) of the subjects revealed a significant decrease ($P \leq 0.01$) in the consumption of energy. This was due to the decreased consumption of cereals, visible fat, sweets and puddings, fried and fast foods by the subjects. There was a significant decrease ($P = 0.01$) in the intake of proteins as the subjects decreased the intake of meat and meat products. A slight decrease in the

carbohydrates and a significant increase in the intake of dietary fibre was also observed. This apparently was due to the inclusion of complex carbohydrates and increased consumption of whole grain cereal, pulses, fruits and vegetables. The mean intake of total fat and saturated fatty acids (PUFA) decreased significantly whereas the consumption of polyunsaturated fatty acids increased significantly ($P = 0.01$), this again was apparently due to the increased consumption of cardioprotective foods advised, which provided one gram of PUFA daily. Increased consumption of soyabean, mustard oil, whole grain cereals and pulses etc. and decreased consumption of visible fat were also the contributing factors. Dietary cholesterol decreased significantly ($P = 0.01$) due to the decreased consumption of

Table 2: General information of the subjects

S.No.	Particulars	n	
1.	Age (years)		
	20-40	6	(17.14)
	40-49	29	(82.86)
2.	Size of the Family		
	2-4 members	12	(34.28)
	4-6 members	20	(57.15)
	>6 members	3	(8.57)
3.	Family Income/Month (Rs.)		
	15,000 – 20,000	9	(25.7)
	20,000 – 25,000	21	(60.2)
	> 25000	5	(14.28)
4.	Family Liabilities		
	House loan	14	(40.00)
	Marriage of kids	18	(51.43)
	Dependable elder	3	(8.57)
5.	Physical Activity		
	Walking	15	(42.85)
	Brisk walking	3	(8.57)
	Cycling	2	(5.71)
	Badminton	3	(8.57)
	No physical activity	12	(34.3)
6.	No. of Cigarettes Smoked		
	0	20	(57.15)
	< 5	-	(0.00)
	10 – 15	10	(28.57)
	> 15	5	(14.28)
7.	Frequency of Alcohol Consumption		
	Non-alcoholics	9	(25.71)
	Daily	19	(54.28)
	Occasionally	6	(17.14)
	Rarely	1	(2.86)
8.	Family History of		
	Heart attack	11	(31.46)
	Diabetes	6	(17.14)
	Hypertension	9	(25.70)
	Obesity	9	(25.70)
9.	Suffering from		
	Hypertension	17	(48.57)
	Hypercholesterolemia	8	(22.86)
	Obesity	7	(20.00)
	Diabetes	3	(8.57)

Figures in parentheses are percentages.

Table 3: Daily nutrient intake of the subjects (Mean \pm S.E.)

Nutrients	Beginning of the Study	End of the study	t-values	RDA (g)
Energy (Kcal)	2516.37 \pm 438.1	2160.94 \pm 272.4	4.02**	2425 ¹
Proteins (g)	76.34 \pm 9.54	68.8 \pm 6.8	3.71**	60 ¹
Carbohydrates (g)	328.1 \pm 45.2	321.05 \pm 29.1	.77 ^{NS}	-
Total fat (g)	77.6 \pm 12.1	53.6 \pm 9.5	9.04**	
PUFA (g)	12.1 \pm 2.8	16.08 \pm 7.7	2.81**	
SFA (g)	42.8 \pm 11.3	26.1 \pm 6.9	7.33**	
P:S ratio	0.29 \pm 0.9	0.588 \pm .146	9.90**	0.8-1 ¹
Cholesterol (mg)	112.6 \pm 55.4	29.4 \pm 9.33	8.64**	300 ¹
Dietary fibre (g)	17.9 \pm 4.35	23.54 \pm 3.17	6.09**	40g ¹
n-6/n-3	.901 \pm 1.2	4.5 \pm 0.95	16.9**	<5 ²
Ascorbic acid (mg)	126.4 \pm 46.6	617.0 \pm 164.7	16.71*	40 ¹
b-carotene (mg)	1538.4 \pm 1052.4	6865 \pm 1212.8	19.34**	2400 ¹
Sodium (mg)	231.74 \pm 8.8	190.92 \pm 68.2	5.07*	28 ¹

* Significant $P = 0.01$

** Significant $P = 0.01$

NS – Non-significant

1. ICMR (1989)

2. Bhoraskar and Raheja (1994)

egg yolk, whole milk, red and organ meat. A significant decrease in the linoleic/ α -linolenic acid (n-6/n-3) ratio from 8.88 ± 1.2 to 4.5 ± 0.95 ($P = 0.01$) was observed at the end of the study period. This was due to the increase in the consumption of soyabean oil, mustard, rice bran oil, *alsi*, fenugreek seeds, whole wheat, fish and an increased consumption of blackgram, cowpea, rajmah and soya pulses in the dietaries of the subjects. A significant increase ($P = 0.01$) in the intake of ascorbic acid and β -Carotene was observed. This increase was due to the inclusion of the cardioprotective foods as these foods contributed about 556 mg of ascorbic acid and 603.8 mg of β -Carotene. Impact of nutrition education was obvious from the increased consumption of fruits which was also a contributing factor for increase in ascorbic acid.

The consumption of sodium decreased significantly as the subjects curtailed from the consumption of processed and preserved fruits, dry fruits, dates, pickles, papads and started the consumption of low sodium foods like whole cereals, fresh fruits, vegetables like cucumber, tomato, onion, brinjal, pumpkin etc. Ghafoorunissa and Krishnaswamy (1998) suggested that high blood pressure patients have to restrict the intake of sodium rich foods like dry fruits, meat, milk products, beet root, carrot, radish, spinach, biscuits and pasteries etc.

Table 4 indicates the clinical and lipid profile of the subjects. A significant decrease in systolic blood pressure (SBP) and diastolic blood pressure (DBP) was observed. This was due to the increased intake of vitamin C and β -carotene and decreased intake of salt. Efficacy of multiple dietary therapies had a significant effect on the lipid profile of the subjects which was evident from a significant decrease ($P = 0.01$) in the serum total cholesterol, low density lipoprotein cholesterol (LDL-C), very low density lipoprotein cholesterol (VLDL-C), total cholesterol: High density lipoprotein - cholesterol (HDL-C), low density lipoprotein - cholesterol: high density lipoprotein - cholesterol (LDL-C: HDL-C) ratio and total triglycerides was observed. A slight increase in HDL-C was also observed. Decreased lipid profile was attributed to the inclusion of cardioprotective foods like garlic, onion, tomato, *amla* and *alsi* in the dietaries of the subjects as

Table 4: Clinical and lipid profile of the subjects (Mean \pm S.E.).

Parameters	Beginning of the study	End of the study	t-values	Standards
Systolic blood pressure (mm Hg)	174.85 \pm 13.11	156.4 \pm 12.6	5.9**	<120 ¹
Diastolic blood pressure (mmHg)	124.14 \pm 11.9	112.4 \pm 11.4	4.11**	<80 ¹
Total cholesterol (mg%)	209 \pm 40	170.74 \pm 66.4	2.92**	<200 ²
LDL-C (mg%)	135 \pm 38	114.08 \pm 43.4	21.5*	<130 ²
VLDL-C (mg%)	32.32 \pm 8.61	19.62 \pm 9.74	5.77**	<40 ³
HDL-C (mg%)	39.74 \pm 7.34	41.08 \pm 6.42	NS	40 ³
Total cholesterol: HDL-C	5.21 \pm 0.96	3.78 \pm 1.95	3.86**	>5 ⁴
LDL: HDL	3.45 \pm 1.09	2.78 \pm 1.33	2.31*	>3 ⁴
Total triglycerides (mg%)	203.6 \pm 4.6	178.1 \pm 4.3	4.23*	<150 ²

* Significant $P = 0.01$

** Significant $P = 0.01$

NS – Non-significant

1. Raghuram et al. (1993)

2. NCEP(1988)

3. Ghafoorunissa and Krishnamurthy (1998)

4. Castelli et al. (1977)

these foods have a hypolipidemic and hypocholesterolemic effect. Decreased intake of total energy, fats especially saturated fatty acid (SFA) and cholesterol and increased polyunsaturated : saturated fatty acid (P:S) ratio, dietary fibre and vitamins also resulted in decrease of the lipid values of the subjects. Vadhera et al. (1995), Etherton et al. (1997), Adler et al. (1997) and Broihier (1999) also reported that garlic and onion had hypolipidemic and hypocholesterolic effects. Fuhrman et al. (1997) Klipstein et al. (2000), Arab and Steck (2000) reported that lycopene from tomatoes had a lipid lowering effect as it enhances LDL-degradation and binds cholesterol.

Thus, in the present study apparently the inclusion of cardioprotective foods like garlic, onion, tomato, *amla*, and *alsi* coupled with nutrition education had a significant effect on

the lipid profile of the subjects which was clear from the reduction in total cholesterol, LDL-C, VLDL-C, total cholesterol: HDL-C, LDL: HDL-C ratio and an increase in HDL-C. Therefore it is recommended that these cardioprotective foods be included in the dietaries to reduce the risk of factors associated with the coronary heart disease.

KEY WORDS Cardioprotective Foods. Coronary Heart Disease (CHD). Lipid Profile. n-6/n-3 Ratio. Nutrition Education.

ABSTRACT : Thirty-five male subjects in the age group of 20-49 years, belonging to a same professional class and who were at risk of coronary heart disease were selected. Background information, blood and lipid profile analysis, blood pressure and dietary survey was recorded. In addition to their normal diet, the subjects were asked to include five cardioprotective foods like garlic (6g/day), onion (50g/day), tomato (200g/day), *amla* (100g/day) and *alsi* (1/2 tsp/day) for a period of 4 months. They were also imparted nutrition education during this period. The effect of cardioprotective foods and nutrition education was studied on the blood and lipid profile parameters. At the end of the study noteworthy changes were observed which showed a significant reduction in the systolic and diastolic blood pressure, total cholesterol, LDL-C, VLDL-C, total cholesterol: HDL-C, LDL-C: HDL-C and total triglycerides whereas an increase was observed in HDL-C. A significant reduction in the n-6/n-3 ratio from 8.88 ± 1.2 to 4.5 ± 0.95 g was observed which apparently was due to the inclusion of cardioprotective foods like garlic, onion, tomato, *amla* and *alsi* coupled with nutrition education.

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