

Assessment of Dietary Intake by Food Frequency Questionnaire in at Risk Coronary Heart Patients

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ABSTRACT Study was conducted on sixty at risk male heart patients in the age group (30-50 years). Dietary intake was assessed by food frequency questionnaire using 24-Hours-Recall method for three consecutive days. Nutrition education was also imparted for 4 months. Frequency of consumption of unrefined cereals, whole pulses, sprouts, roots and tubers, fruits and vegetables was increased but a frequency of intake of salty fried preparations, Bakery products, meat and poultry, sweets and puddings, Green Leafy Vegetables (GLV) was decreased after nutrition counselling. Significant increase was observed in average intake of proteins, dietary fibre, n-6 fatty acids, vitamins and minerals due to increase in average daily intake of pulses, sprouts, other vegetables, fruits, roots and tubers and less intake of fat and energy dense foods. Percentage contribution of calories by different nutrients were found to be within recommended daily allowances.

INTRODUCTION

Coronary heart disease (CHD) is emerging as the major killer throughout the world. The prevalence of CHD in urban India (10%) is about double that of rural India (5%) and about 4 fold higher than in United States (2.5%). The major underlying cause of coronary heart disease is atherosclerosis. Increase in body weight and blood lipids are infact end results of prolonged faulty dietary habits including excess consumption of refined cereals, high cholesterol foods, Saturated Fatty Acids (SFAs), sugar and fried foods. Improper dietary practices can also trigger underlying genetic tendencies towards atherosclerosis. By adopting a prudent diet of protective foods like fruits and vegetables and less of sugar and oil consumption one can reduce the risk of CHD. Counselling also results in noteworthy changes in food adjustments, food preparation practices, increase in healthy food and beverage choices. Therefore, the present study had been undertaken for assessing the dietary intake among Punjabi population by food frequency questionnaire especially in those who are at risk of CHD.

MATERIALS AND METHODS

A dietary survey was carried out to get information on the dietary pattern, nutrient intake, source of nutrients and food habits. Detailed information on food intake was observed for three consecutive days by using 24-Hour-Recall

Method. Quantity of food consumed by subjects was obtained using standardized containers. Information on quantities of ingredients like sugar, ghee, salt, cereals, pulses, vegetables and cooking methods used for different foods were obtained. The different food items were converted into raw equivalents and the average daily intake of energy, proximate principles, important vitamins and minerals were calculated by computer programme 'MSU' nutritguide (Song et al., 1992) and food composition tables (Gopalan et al., 1991). On the basis of above information nutrition education was imparted for a period of four months at two weeks interval in which special stress is laid to increase the intake of high fibre fruits, vegetables, low calorie diet and to decrease the intake of energy dense foods, fats & oils, non-vegetarian preparations, fried foods.

RESULTS AND DISCUSSION

The frequency of consumption of unrefined cereals (Table 1) was observed to be three times a day in 45 per cent of subjects but the frequency increased to 65 per cent after nutrition education. Anderson (1999) suggested that whole grain intake is associated with reduced risk of developing diabetes and hypertension as these provide complex carbohydrates, fibre, minerals and vitamins. Frequency of intake of pulses was once a day in 25 per cent of subjects but it rose to two times a day in 46.57 per cent of subjects after nutrition education. Antia and Abraham

Table 1: Frequency of daily food consumption pattern of the subjects (n=60)

Food groups	Beginning of the study (No. of times per day)					End of the study (No. of times per day)										
	3	2	1	0	3	2	1	0								
1. (a) Cereals unrefined	27	(45.0)	25	(41.57)	3	(5.00)	17	(28.33)	3	(5.00)	1	(1.57)				
(b) Cereals refined	4	(6.57)	12	(20.00)	15	(25.00)	9	(15.00)	17	(28.33)	34	(56.66)				
2. Pulses																
(a) Whole		-	13	(21.66)	23	(38.33)	24	(40.00)	28	(46.57)	17	(28.33)	15	(25.00)		
(b) Dehusked		-	15	(25.00)	27	(45.00)	18	(30.00)	-	14	(23.33)	17	(28.33)	29	(48.33)	
(c) Sprouts		-	-	-	5	(8.33)	55	(91.6)	-	-	10	(16.67)	50	(83.3)		
3. Milk & milk products	10	(16.57)	34	(56.57)	11	(18.33)	5	(8.33)	11	(18.33)	37	(61.57)	10	(16.57)	2	(3.33)

Figures in parenthesis indicate percentages.

Table 2: Frequency of weekly food consumption pattern of the subjects (n=60)

Food groups	Beginning of the study (No. of times per day)					End of the study (No. of times per day)				
	3	2	1	0		3	2	1	0	
1. Salty fried preparation	15	(25.00)	28	(46.57)	17	(28.33)	-			
2. Sweets and puddings	11	(18.33)	14	(23.33)	13	(21.57)	22	(36.57)	7	
3. Bakery products	9	(15.00)	20	(33.33)	14	(23.33)	17	(28.33)	3	
4. Meat and Poultry	5	(8.33)	30	(50.00)	8	(13.33)	17	(28.33)	3	
5. Green leafy vegetables	7	(11.57)	12	(20.00)	36	(60.00)	5	(8.33)	20	
6. Roots & tubers	15	(25.00)	25	(41.66)	17	(28.30)	3	(5.00)	60	
7. Other vegetables	60	(100.0)	-	-	-	-	-	-	60	
8. Yellow fruits	9	(15.00)	5	(8.33)	36	(60.00)	10	(16.56)	16	
9. Other fruits	19	(31.56)	22	(36.56)	14	(23.33)	37	(61.56)	38	
10. Canned	-	-	13	(21.56)	10	(16.56)	5	(8.33)	19	
11. Dry fruits	3	(5.00)	18	(30.00)	32	(53.3)	7	(11.6)	5	

Figures in parenthesis indicate percentages.

(1997) also noted that pulses and beans help to lower blood cholesterol. At the beginning of study 56 per cent of subjects used to consume milk and milk products two times a day but the frequency of intake rose to 61 per cent two times a day after nutrition education. Frequency of Green leafy vegetables was found to decrease during post data collection due to the seasonal variation. Increase was also observed in the intake of roots and tubers. Due to the seasonal availability of mangoes, papaya the frequency of intake of yellow fruits was observed to be increased. At the beginning of study 8.33 per cent of subjects used to have yellow fruits only twice a week but after nutrition education 26.6 per cent of subjects started consuming yellow fruits thrice a week. Keith et al. (2001) also reported the increasing intake of fruits increases plasma levels of vitamin C, E, carotenoids and certain flavonoids. Higher intakes of fruits like *plums, cherries, litchi, watermelon, muskmelon, papaya* were observed about thrice a week after nutrition education. Frequency of canned and dry fruits was observed to decreased due to less intake of nuts in summer season. Dietrich (2002) also supported that fruits are delicious natural capsules of vitamins and minerals offering protection against heart disease. A marked decrease in frequency of consumption of bakery products, sweets and puddings, fried and fast foods were seen after the nutrition education.

The mean daily intake of cereals significantly ($P<0.01$) decreased from 285 ± 34.68 g to 245 ± 31.52 g at the end of study due to high consumption of whole grains which increase the satiety value. Slight increase was observed in the average daily intake of pulses and legumes i.e. 53.4 ± 9.85 to 54.5 ± 10.17 g due to increase in consumption of whole pulses and sprouts by the subjects. Decrease was observed in average intake of green leafy vegetables from 101 ± 14.77 to 60 ± 11.09 g after nutrition education due to the seasonal unavailability. A significant increase in the intake of other vegetables was observed from 127 ± 15.43 to 222 ± 26.54 g at the end of study period which was attributed to the intake of seasonal vegetables like bitter gourd, bottle gourd, tinda, ash gourd, ridge gourd, pumpkin, cucumber, lady's finger etc. Slight increase in the consumption of roots and tubers was observed from 60 ± 10.13 to 85 ± 13.28 that was mainly attributed by onions and potatoes. Significant increase ($P<0.01$) was observed in consumption

of fruits due to seasonal availability. Noakes et al. (2002) also reported that subjects having ≥ 5 servings of fruits observed decrease in Low Density Lipoprotein-Cholesterol (LDL-C). Significant decrease ($P<0.01$) was observed in the intake of milk and milk products meat and poultry, sugar and jaggery, nuts and oilseeds, fats and oils after the nutrition education. Sandhu (1998) reported that consumption of (30-60g) of fats and oils in the subjects before counselling was positively associated with atherosclerosis.

The main intake of energy was significantly decreased ($P<0.01$) after nutrition education due to less intake of energy dense foods and foods processed with fat, salt and sugar. A significant increase was reported in the present study due to increase in intake of whole pulses, soyabean, sprouted products. Clarkson (2002) reported that increase in intake of soyabean and pulses could result in 20-30 per cent reduction in heart disease. Significant decrease ($P<0.01$) in carbohydrates intake was observed due to decrease in intake of refined flours. Intake of complex carbohydrates was increased. Jenkins et al (2002) reported that high intake of complex carbohydrates significantly lower total cholesterol and LDL-C. Intake of cholesterol was significantly ($P<0.01$) decreased from 100 ± 7.98 to 29.54 mg due to less intake of eggs, meat, 29 ± 2.54 desi ghee and oils. Weggemans et al. (2001) reported that consuming an additional egg increase the ratio of total to LDL-C by 0.040 units. Significant decrease ($P<0.01$) in intake of total fat, SFAs, Polyunsaturated Fatty Acids (PUFAs) was observed from 75 ± 4.06 , 17 ± 2.66 , 45 ± 4.81 g to 54.3 ± 3.11 , 12.5 ± 1.84 , 17.1 ± 24.5 g due to less intake of desi ghee and PUFA rich oils whereas significant ($P<0.01$) increase was observed in Monounsaturated Fatty Acid (MUFA) and P: S ratio due to increase intake of corn oil, kardi oil, safflower oils. Intake of dietary fibre was increased from 18 ± 3.41 to 26 ± 3.57 due to increased consumption of soluble fibre from fruits, vegetables and legumes.

Significant decrease ($P<0.01$) was observed in n-6 and n-6/ n-3 ratio after the nutrition education and fatty acids. Significant increase was reported in n-3 fatty acids due to the consumption of whole grains, fish, fenugreek, pulses, corn, kardi, soyabean, rice bran oil. Nestel (2000) and Thies et al. (2001) also reported that low intake of n-6 fatty acids and high intake of n-3 fatty acids is associated with lower risk of heart disease

Table 3: Daily food intake of the subjects (mean±S.D.)

Food groups g/day	Beginning of the study	End of the study	Paired t-value	RDA (g)
Cereals	285±34.68	245±31.52	7.43***	350 -400
Pulses and legumes	53.4±9.85	54.5±10.17	1.26 ^{NS}	40 - 50
Green leafy vegetables	101.1±14.77	60±11.09	14.43***	50 - 100
Other vegetables	127±15.43	222±26.54	19.09***	60 - 75
Roots and tubers	60±10.13	85±13.28	10.68***	70 - 100
Fruits	90.2±17.64	213±39.77	18.84***	50 - 100
Meat and poultry	79.15±9.69	60.15±7.23	7.26***	40 - 60
Milk & milk products	384±36.71	300±35.03	11.45***	200 - 250
Sugar and jaggery	17.5±2.19	12.5±1.84	8.13***	20 - 30
Fats and oils	47.5±8.57	24.4±5.11	14.61***	20 - 40
Nuts and oilseeds	7.78±1.33	3.00±0.93	19.84***	

** Significant at 5% level

*** Significant at 1% level

NS Non-significant

Table 4: Daily Nutrient intake of the subjects (mean±S.D.)

Nutrients	Beginning of the study	End of the study	Paired t-value	RDA
Energy (Kcal)	2355±234.61	1947±201.57	11.37***	1800 -2400kcal
Protein (g)	65±3.74	68.3±4.09	5.26***	50 - 70g
Carbohydrates (g)	350±28.55	275±30.41	9.67***	300 - 340g
Total fat (g)	75±4.06	54.3±3.11	16.44***	40 - 60g
Polyunsaturated fatty acids (g)	17±2.66	12.5±1.84	7.49***	<18. 56g
Saturated fatty acids (g)	45±4.81	17.1±2.45	28.64***	<20g
MUFA (g)	13.00±1.37	24.3±3.67	17.57***	<20g
P: S ratio	0.3778±0.004	0.73±0.09	14.69***	0.8- 1
Cholesterol (mg)	100±7.48	29±2.54	34.56***	300 mg
Dietary fibre (g)	18±3.41	26±3.57	11.73***	40g
n-6	17.6±2.73	9.7±1.89	9.54***	11.56g
n-3	1.5±0.87	1.8±0.98	3.19***	2.3g
n-6/n-3	9.77±1.96	6.46±1.09	8.59***	5 - 10

*** Significant at 1% level

ICMR (1989)

significant increase ($P<0.01$) was also observed in the intake of antioxidants such as β -carotene, vitamin C, vitamin E, B-complex vitamins and minerals. But increase intake of antioxidants and B-complex vitamins did not come up to the standards set for heart patients. Intake of minerals was adequate and hence found to be cardio-protective

Based on the percent contribution of energy by major nutrients i.e. carbohydrates, fats, proteins, it was found there was increase in percentage contribution of energy from protein (11.04 to 14.03%) but contribution of carbohydrates and fats to the total energy had decreased from (59.44 to 56.49%) and (28.56 to 25.10%) respectively. There was decrease in percentage contribution of energy from PUFAs and SFAs from (6.49 to 5.78%) and (17.19 to 7.30%) but increase was observed in case of MUFAs (4.96 to 11.2%). Findings of present study were

according to the guidelines by Gopalan and Krishnaswamy (2000). Vindon *et al* (2001) and Suh *et al.* (2001) suggested that in order to lower the LDL-C and improve LDL-C there is need to improve percent of calories from complex carbohydrates along with 10% of calories each from SFAs, PUFAs and MUFAs. Thus it can be concluded from the results of present study there is need to increase the intake of at least 5-6 servings of fruits and vegetables complex carbohydrates and to reduce intake of fats and oils, bakery products, fried foods, non- veg preparation as far as possible by at risk heart patients.

REFERENCES

- Anderson, J.W. and Anna, T.J.: Whole grains and protection against coronary heart disease. *Am. J. Clin. Nutr.*, **70**: 307-8 (1999).
- Antia, F.P. and Abraham, P. (Ed): *Clinical Dietetics and*

Table 5: Impact of nutrition education on the intake of dietary antioxidants and related nutrients (Mean±S.D.).

Category	Beginning of the study	End of the study	Paired	t-value	Desired ranged
1. <i>Antioxidants</i>					
Ascorbic acid (mg)	103.30±11.65	154.00±16.87		16.84***	½ - 4g
β-carotene (mg)	3360±854.21	8163±1269.56		26.48***	50 mg
Vitamin E (mg)	9.00±1.34	19.00±2.45		19.81***	200-400 IU
2. <i>B-Complex Vitamins</i>					
Thiamine (mg)	1.6±0.97	1.83±1.59		1.63 ^{NS}	20-100 mg
Riboflavin (mg)	1.7±0.99	1.616±0.78		1.06 ^{NS}	20-100 mg
Niacin (mg)	15.3±10.47	18.56±12.11		1.71 ^{NS}	100-600 mg
Folic acid (mg)	200±72.84	236.356±81.15		3.77***	400-800
Vitamin B ₁₂ (mg)	0.25±0.11	3.5±1.23		7.45***	100 mcg
3. <i>Minerals</i>					
Magnesium (mg)	166±23.67	654±106.71		19.61***	350
Potassium (mg)	1532±43.39	1738±684.69		3.9***	-
Calcium (mg)	1598±496.21	939.30±284.62		11.74***	400
Phosphorus (mg)	1738±511.64	1835±723.92		1.71 ^{NS}	400
Iron (mg)	30±4.41	36.56±6.23		7.29***	28
Sodium (mg)	973±113.32	271.30±65.71		28.84***	-
Zinc (mg)	4±1.13	4.10±1.19		0.93 ^{NS}	15

** Significant at 5% level

*** Significant at 1% level

NS Non-significant

Pauling (2002)

Table 6: Percentage calories in the dietaries of the subjects (Mean±S.D.)

Nutrients	Beginning of the study	End of the study	Paired	t-value	Recommendation
Protein	11.04±1.56	14.03±1.93		7.57***	10 - 15
Carbohydrates	59.44±6.61	56.49±5.63		3.85***	55 - 65
Total fat	28.56±3.74	25.10±3.11		6.51***	15 - 30
PUFA	6.49±1.13	5.78±0.92		4.81***	8
SFA	17.19±2.84	7.30±1.26		19.63***	10
MUFA	4.96±0.83	11.2±1.91		17.02***	10

*** Significant at 1% level

¹Guidelines, WHO (1990)²Ghafoorunissa and Krishnaswamy (1994)

- Nutrition*. Oxford University Press, Delhi. pp 396-415 (1997).
- Clarkson, T.B.: Soy, soy phytoestrogens and cardiovascular disease. *Am. J. Clin. Nutr.*, **132**: 566S-69S (2002).
- Dietrich, M., Block, G., Hudes, M., Morrow, J.D., Norkub, E.P., Traber, M.G., Cross, C.E. and Packer, L.: Antioxidant supplementation decreased lipid peroxidation biomarker F- isoprostones in plasma of smokers. *Cancer Epidemiol Biomarkers Prev.*, **11**: 7-13 (2002).
- Ghafoorunissa and Krishnaswamy, K.: Fatty acid composition of food items. In: *Diet and Heart Disease*. pp 40-51. National Institute of Nutrition, Hyderabad (1994).
- Gopalan, C. and Krishnaswamy, K.: *Nutrition in Major Metabolic Diseases*. p 119. Oxford University Press, New Delhi (2000).
- Gopalan, C., Ramasastri, B.V. and Balasubramanian, S.C. *Nutritive Value of Indian Foods*. 3rd Ed. National Institute of Nutrition, ICMR, Hyderabad (1991).
- I.C.M.R.: Nutrient requirements and recommended dietary allowance for Indians. NIN, Hyderabad (1989).
- Jenkins, J.A., Kendall, W.C., Vuksan, V., Parker, T., Faulkner, D., Mehlin, C.C. and Carey, P.N. Soluble fibre intake at a dose approved by US food and drug administration for a claim of health benefits. Serum lipids risk factors for cardiovascular disease assessed in a randomized controlled cross over trail. *Am. J. Clin. Nutr.*, **75**: 834-839 (2002).
- Keith, M.E., Jeejeebhoy, K.N., Langer, A., Kurian, R., Barr, A., Kelly, B.O. and Sole, M.J. A controlled clinical trails of vitamin E supplementation in patients with congestive heart failure. *Am. J. Clin. Nutr.*, **73**: 219-24 (2001).
- Nestel, P.J.: Fish oil and cardiovascular disease: lipids and arterial function. *Am. J. Clin. Nutr.*, **Supple 71**: 228S-31S (2000).
- Noakes, M., Clifton, P., Ntanas, F., Sheapnel, W., Record, I. and McInerney, J. An increase in dietary carotenoids when consuming plant sterols or stanols is effective in maintaining plasma carotenoid concentration. *Am. J. Clin. Nutr.*, **75**: 79-86 (2002).
- Pauling, L. Health is determined by the nutrients you happen

- not to get, Heart Health Organisation <http://www.hearthealth.org/vitamins.htm>. (2002).
- Sandhu, N.: *Impact of Dietary Counselling on Male Coronary Heart Disease Patients Belonging to Business Community*. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, India (1998).
- Song, W.O., Hoers, Bond, J., Kakaral, M., Mann, S.K., Sihgal, S., Pande, U., Singh, U., Mehta, U. and Rohinidevi: A nutrient analysis computer program. Michigan State University, America (1992)
- Suh, I., Oh, K.W., Lee, K.H., Psaty, B.M., Nam, C.M. and Shim, W.H.: Moderate dietary fat consumption as a risk factor for ischemic heart disease in population with low fat intake: case control study in Korean men. *Am. J. Clin. Nutr.*, **73**: 722-27 (2001).
- Thies, F., Caran, G.N., Powell, J.R., Yaqoob, P., Newsholme, E.A. and Calder, P.: Dietary supplementation with eicasapentaenoic acid, but not with other long n-3 or n-6 polyunsaturated fatty acids decrease natural killer activity in a healthy subjects. *Am. J. Clin. Nutr.*, **73**: 539-48 (2001).
- Vindon, C., Boucher, P., Cachefo, A., Peroni, O. and Beyfat, M.: Effects of isoenergetic high carbohydrate compared with high fat diets on human cholesterol synthesis and expression of key regulatory genes of cholesterol metabolism. *Am. J. Clin. Nutr.*, **13**: 878 (Abstr) (2001).
- Weggemans, R.M., Zock, P.L. and Katan, M.B.: Dietary cholesterol from eggs increases the ratio of total cholesterol to high – density lipoprotein cholesterol in humans: A meta analysis. *Am. J. Clin. Nutr.*, **73**: 885-91 (2001).
- W.H.O.: *Diet, Nutrition and the Prevention of Chronic Disease*. WHO, Geneva (1990).