Comparison of Serum Cholesterol Fractions Levels in Albino Rats on Monounsaturated (Olive Oil) Fat Diet

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That dietary fat can significantly affect the atherosclerosis and increased level of low density lipoproteins cholesterol in the serum is a high risk while the increased high density lipoprotein cholesterol level is a low risk for the development of atherosclerosis. The study was conducted to compare the levels of cholesterol fraction with in experimental animals on different dietary fats.

Materials and Methods: The study was comprised of 36 albino rats of 32 weeks age, with equal number of males and females. These were kept under optimum temperature and hygienic conditions with adequate availability of food and water. The blood samples were drawn at the beginning and the end of study. The animals were given different control and experimental diets for 20 weeks. The experimental diets were added with olive oil as 20% olive oil diet. The blood samples were taken at the end of the study and the results were compared.

Result: The mean serum HDL-c in the control rats without atherogenic diet at week 0 and 32 are 29.08 ± 2.71 and 24.09 ± 2.11 mg/dl. The difference was highly significant, and the mean serum HDL-c in the control rats with atherogenic diet at week 0 and 32 are 31.66 ± 3.39 and 20.00 ± 2.60mg/dl. The difference is statistically very highly significant. The mean serum LDL-c in control rats without atherogenic diet at week 0 and 32 are 35.00 ± 6.52 and 40.45 ± 5.04 mg/dl. The difference is statistically significant from the experimental animals. The total serum cholesterol in the experimental group (olive oil) at week 0 and 32 are 88.66 ± 10.43 and 125.09 ± 8.09mg/dl. The difference was statistically highly significant. The mean serum HDL-c at week 0 and 32 are 33.66 ± 3.52 and 66.54 ± 10.02 mg/dl. The difference is statistically very highly significant (Table 3.2). The mean serum LDL-c at week 0 and 32 are 35.66 ± 7.70 and 35.09 ± 6.77 mg/dl. The difference was statistically non-significant.

Conclusion: We concluded that a significant decrease in serum LDL-c level and increase in serum HDL-c level found in animals on diet with olive oils might be a protective sign in the prevention of atherosclerosis.

Key words: Atherogenic, Olive oil, low density lipoprotein cholesterol, low density serum lipoprotein cholesterol.

Introduction

Cardiovascular disease remains the chief cause of death in the United States and Western Europe, and atherosclerosis, the principal cause of myocardial infarction, accounts for the majority of this deaths.[1] It is particularly common in affluent countries and one obvious difference between these countries and poorer nations is the diet. The high prevalence of CHD is eastern finland, where intake of butter products are particularly high, is its striking example[2]. CHD has been a global problem since long. It prevails in high class society to low class society and affects all ages specially the middle age group[3]. Hyper lipideima is a major contributing cause of atherosclerosis[4]. In recent past hyper lipoproteinemia states has been more discussed regarding the disease entity, high levels of serum LDL-c with positive and HDL-c with negative correlation pertaining to atherosclerosis have been found by many workers[5]. Olive oil is a source of calories as monounsaturated fatty acid of which oleic acid is the major component with palmetic and linoleic acids in smaller proportions[6]. In Pakistan olive plant is cultivated in Baluchistan, Punjab, North West Frontier and Azad Kashmir areas. Olive oil is prepared by extraction from the ripe fruit. A plant yields 10-15 kg fruit / season.[7-8]

The purpose of this study was to assess the effect of diet containing monounsaturated fatty acid (olive oil) on lipid profile in albino rats.

Material and Methods

Thirty six albino rats of 32 week age, including equal number of males and females were distributed randomly into three groups of 12 rats each. Each group had equal number of male and female rats. The albino rats were maintained under optimum atmospheric and hygienic conditions, with food and water available at all times. The initial experimental diet was given for 12 weeks, and then atherogenic supplement, namely cholesterol, propylthiouracil and bile salts was added to the experimental diets for 12 weeks. Before starting experimental atherogenic diet 12-14 hours fasting blood was taken, centrifuged and labeled. The other sample was taken after 20 weeks with same protocol. All the samples were estimated for total cholesterol, high density lipoproteins cholesterol and low density lipoprotein cholesterol. (Diet concentrations are given in table 1 and 2).

Results

The mean serum total cholesterol in the control rats with

atherogenic diet at week 0 and 32 were 89.16 ± 7.60 and 101.54 ± 7.6 mg/dl. The difference was statistically highly significant, and the serum total cholesterol in the control rats with atherogenic diet at week 0 and 32 are 87.00 ± 7.04 and 123.27 ± 18.48 mg/dl. The difference is very highly significant (Table 3). The mean serum HDL – cholesterol in the control rats without atherogenic diet at week 0 and 32 were 29.08 ± 2.71 and 24.09 ± 2.11mg/dl. The difference is highly significant, and the mean serum HDL- cholesterol in the control rats with atherogenic diet at week 0 and 32 were 31.66 ± 3.39 and 20.00 ± 2.60 mg/dl. The difference is statistically very highly significant (Table 4). The mean serum LDL cholesterol at week 0 and 32 are 33.08 ± 6.72 and 36.18 ± 5.47 mg/dl and the difference was statistically non significant. The mean serum LDL – cholesterol in control rats without atherogenic diet at week 0 and 32 were 35.00 ±6.52 and 40.45 ± 5.04 mg/dl while the difference was statistically significant.

The total serum cholesterol in the experimental group (olive oil) at week 0 and 32 were 88.66 ± 10.43 and 125.09 ± 8.09 mg/dl. The difference was statistically very highly significant (Table 3.1). The mean serum HDL cholesterol a week 0 and 32 are 33.66 ± 3.52 and 66.54 ± 10.02 mg/dl. The difference was statistically highly significant (table 3.2). The mean serum LDL – cholesterol at week 0 and 32 were 35.66 ± 7.70 and 35.09 ± 6.77 mg/dl and this difference is statistically non-significant (Table 4).

Table 1: *Percentage Composition of Synthetic Diet for Rats. (Adopted from Malathi et al 1963).*

Ingredients	Percentage (g)
Casein	20.0
Maize Starch	60.0
Cane Sugar	10.0
Corn oil	5.0
Choline and Methionine	0.5
Mineral Mixture	3.5
Vitamin Mixture	1.0
Total	100.00

Table 2: *Percentage Composition of the Experimental Diets (g).*

DIET GROUPS				
		I	II	III
S. No.	Ingredient	Control Diet %	Control Diet %	Control Diet %
1.	Wheat starch	60.0	58.6	43.6
2.	Casein	20.0	20.0	20.0
3.	Cane Sugar	10.0	10.0	10.0
4.	Olive oil	1.0	1.0	20.0
5.	Choline & Methionine	0.5	0.5	0.5
6.	Mineral Mixture	3.5	3.5	3.5
7.	Vitamin Mixture	1.0	1.0	1.0
8.	Cholesterol	-	1.0	1.0
9.	Propylthiouracil	-	0.1	0.1
10.	Bile Salt	-	0.3	0.3

Discussion

This study was conducted to compare the levels of cholesterol fraction with control and olive oil fat diet in albino rats. In this study, comparison of serum lipid profile and olive oil showed higher hypolipidaemic effect and higher levels of HDL-c. Sertori et al.[9] In a 20 week study found slight decrease in LDL-c levels and unchanged or increased levels of HDL-c with olive oil, while Bagio et al.[10] Observed unchanged levels of HDL-c with olive oil diet. However Mc Donald et al[11] reported decrease in the levels of LDL-c with maintenance of HDL-c using canola oil as a source of oleic acid. Studies of olive oil have shown that olive oil enriched diets lower LDL-c and preserve or increase HDL-c.[12-14]

Table 3: *Comparison of mean serum cholesterol level (mg/dl) between 0 and 32 weeks.*

Subject	Males			Female			Total		
	0 week	32 weeks	% Difference	0 week	32 Weeks	% Difference	0 week	32 weeks	% Difference
Control I	94.83 ± 5.45	106.60** ± 6.10	12.41	83.50 ±4.50	97.33*** ± 6.47	16.56	89.16 ±7.60	101.54*** ± 7.69	13.88
Control II	91.50 ± 5.20	130.60** ± 24.73	42.73	82.50 ± 5.85	117.16*** ± 9.76	42.01	87.00 ±7.04	123.27*** ± 18.48	41.68
Control III	95.66 ± 8.54	130.60** ± 24.73	37.57	81.66 ± 6.97	119.66*** ± 6.08	46.53	88.66 ±10.43	125.09*** ± 8.09	41.00

Key: ** = Significant *** = Highly Significant.

Table 4: *Comparison of mean serum HDL- cholesterol level (mg/dl) between 0 and 32 weeks.*

Subject	Males			Female			Total		
	0 week	32 weeks	% Difference	0 week	32 weeks	% Difference	0 week	32 weeks	% Difference
Control I	29.00 ± 3.16	24.00* ± 2.4	17.24	29.16 ± 2.48	24.16* ± 2.04	17.14	29.08 ± 2.71	24.09*** ± 2.11	17.15
Control II	30.14 ± 3.18	20.00*** ± 2.42	33.64	33.50 ± 2.42	20.00*** ± 3.28	40.29	31.66 ± 3.39	20.00*** ± 2.60	36.82
Control III	32.66 ± 8.54	66.80*** ± 2.94	104.53	34.66 ± 3.61	66.33*** ± 13.92	91.37	33.66 ± 3.52	66.54*** ± 10.02	97.68

Key: * = Significant *** = Highly Significant.

Table 3: *Comparison of mean serum LDL- cholesterol level (mg/dl) between 0 and 32 weeks.*

Subject	Males			Female			Total		
	0 week	32 weeks	% Difference	0 week	32 weeks	% Difference	0 week	32 weeks	% Difference
Control I	38.83 ± 1.72	39.60^{+} ± 4.09	2.00	27.33 ± 4.13	33.33* ± 5.00	22.00	33.08 ± 6.72	36.18^{+} ± 5.47	9.37
Control II	40.50 ± 2.66	41.80^{+} ± 2.48	3.20	29.50 ± 3.72	39.33** ± 6.53	33.32	35.00 ± 6.52	40.45* ± 5.04	15.57
Control III	42.16 ± 3.97	39.00^{+} ± 6.51	7.49	29.16 ± 3.65	31.83^{+} ± 5.45	9.00	35.66 ± 7.70	35.09^{+} ± 6.77	1.59

Key: + = Non Significant.

Pietenen and huttunen.[15] Suggested that olive oil rays HDL-c either by enhancing biosynthesis of apo AI, AII (Apo-lipoproteins of HDL) or by reducing their catabolism. These results suggest that olive oil is found to be least atherogenic. As it promotes HDL-c and lowers LDL-c, so has a protective roll in atherosclerosis.

Conclusion

Olive oil in the diet has a favorable effect on the lipid profile by lowering the triglyceride, total cholesterol and LDL cholesterol and increasing the HDL cholesterol in albino rats.

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