Serum Lipid Profile in Albino Rats Fed on Canola Oil and Atherogenic Elements for 24 weeks duration

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In this study sixty albino rats were selected and were divided into five groups of twelve rats each on the basis of different diets given control group (I) was fed on synthetic died and experimental groups (II, III, IV, V) were fed on 2.9% Canola, 2.9% Canola + atherogenic elements, 20% Canola and 20% Canola + atherogenic elements for 24 weeks duration respectively. Blood samples were collected by heart puncture and lipid profile was done. Results demonstrate that moderate amounts of canola oil (2.9% in diet) has triglyceride and cholesterol lowering effects. Both moderate and high amounts of canola oil (20%) decrease serum LDL-c profiles and resist lowering of HDL-c levels in rats fed with canola oil alongwith atherogenic elements.
Key Words: Canola oil diets, serum lipid profile, albino rats.

Selection of dietary lipids is one of the factors that play an important role in regulating hyperlipidaemia. There is growing evidence that patients can improve their lipid profiles and decrease cardiovascular events by switching their diet from saturated and polyunsaturated fats or monounsaturated fats. It is because increased intake of saturated fats leads to oxidation of LDL-c and increase its uptake by macrophages, foam cell formation within the arterical intima and development of coronary artery obstruction[1,2,3]. The change from saturate to unsaturated diets may improve endothelial dynamics, reduce oxidation of LDL-c and atherosclerosis and enhance thrombolytic activity by decreasing platelet aggregation which is associated to thrombus formation and the risk of stroke and myocardial infarction[4]. It has been observed that people taking diet high in olive oil had lowest plasma TC and LDL-c levels in comparison to others that had used western diet (rich in saturated fatty acids[5]. Monounsaturated fatty acids are present in olive oil, certain nuts, rape-seed and canola oils.

Canola oil increases HDL-c and lowers LDL-c and preserves the myocardium more than the standard cholesterol-rich diet[6]. Canola oil diet rich in monounsaturated fatty acids decreased TC and LDL-c serum levels as compared to saturated fats[7]. The present study was carried out to see the effects of prolonged intake of canola oil supplemented with atherogenic elements on serum lipid profiles.

Methodology

Sixty albino rats were selected and were divided into five groups of twelve rats each (I-V). Diets were prepared for five different groups[8] (Table-1) 2ml blood samples at zero and 24 weeks were collected after overnight fasting[9] TG, TC and HDL-c were estimated by Randox kits using enzymatic colorimetric methods LDL-c was calculated by Friedwald formula. The statistical analysis was done by the help of student's 't' test and level of significance was determined.

Table 1: Groups of albino rats based on diet

Groups	n =	Types of Diets
I (Control)	12	Synthetic diet
II	12	2.9% Canola oil
III	12	2.9% Canola oil+Atherogenic elements
IV	12	20% Canola Oil
V	12	20% Canola Oil + Atherogenic elements

Results:

Results and level of significance of these groups are given in Tables 2-5.

Table 2: Variations in triglycerides (mmol/L) levels (n=12,±SD.)

Groups	Zero-week	24-week
I	1.139 ± 0.069	1.379 ± 0.064
II	1.111 ± 0.075	1.104 ± 0.062
III	1.157 ± 0.071	1.174 ± 0.041
IV	1.120 ± 0.062	1.179 ± 0.049
V	1.114 ± 0.071	1.158 ± 0.037

I vs II is significant ($P < 0.05$) and I vs III, IV, V is highly significant ($P < 0.001$)

Table 3: Variations in total cholesterol (mmol/L) contents (n=12,±SD).

Groups	Zero-week	24-week
I	2.041 ± 0.123	2.567 ± 0.153
II	2.028 ± 0.108	2.396 ± 0.191
III	2.038 ± 0.135	2.123 ± 0.148
IV	2.082 ± 0.147	1.868 ± 0.081
V	2.080 ± 0.124	2.113 ± 0.083

I vs II is significant ($P < 0.05$) and I Vs III, IV, V is highly significant ($P < 0.001$)

Table 4: Variations in LDL-C (mmol/L) contents (n=12,±SD.)

Groups	Zero-week	24-week
I	0.923 ± 0.057	1.353 ± 0.203
II	0.960 ± 0.083	1.243 ± 0.105
III	0.901 ± 0.142	0.988 ± 0.115
IV	0.965 ± 0.141	0.618 ± 0.098
V	0.995 ± 0.141	0.991 ± 0.098

I Vs II, III, IV is highly significant ($P < 0.01$)

Table 5: Variations in HDL-C (mmol/L) levels (n=12,±S.D.).

Groups	Zero-week	24-week
I	0.615 ± 0.038	0.6125 ± 0.038
II	0.583 ± 0.028	0.67 ± 0.028
III	0.611 ± 0.031	0.635 ± 0.023
IV	0.615 ± 0.039	0.731 ± 0.036
V	0.614 ± 0.038	0.611 ± 0.045

I Vs II, IV is highly significant ($P < 0.001$)

Discussion:

Serum TG levels lowered in experimental groups (canola oil diet groups) at 24 week. Our findings are in consistent with the study of Mahley et al (1995)[5] and Sattar (1996)[10] increase of TG in high canola and low canola may be due to increased concentration of high fat (20% canola vs 2.9% canola) and this is in confirmation with the study of Grundy (1987)[11].

Serum TC levels lowered in canola oil groups suggesting that monounsaturated fats cause hypocholesterolaemia as observed by Keys et al (1970)[12]. TC levels lower in high canola groups because of cholesterol lowering effects of oleic acid by enhancing the LDL-c receptors. Similar profiles were shown by Matheson et al (1996)[13] using canola oil in human volunteers.

Serum HDL-c levels at 24 weeks were increased in high canola oil diet groups without atherogenic elements but lowered in atherogenic diet groups as demonstrated by Sahito (1993)[14] and Shad (1991)[15] suggesting that monounsaturated fatty acids favourably increase HDL-c levels.

Serum LDL-c levels were decreased significantly at 24 weeks indicating that canola oil lowers LDL-c after prolonged administration. High canola oil diet showed decrease at 24 weeks. Similar findings are consistent with the results of Wardlaw (1991)[16] and Dreon et al (1990)[17]. These studies demonstrate that prolonged intake of canola oil in albino rats is effective way to reverse the existing atherosclerotic lesions and hyperlipidaemia as a physiological dietary intervention.

Conclusions:

These findings reveal canola oil amongst the important supplement of monounsaturated fatty acids in animals and these findings may be generalized for humans.

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