ORIGINAL ARTICLE

Estimation of Coagulation Parameters in Albino Rats Fed on Canola Oil Supplemented with Atherogenic Diet

AKHTAR MUNIR, MUHAMMAD FAROOQ*

ABSTRACT

Present study was designed to estimate the coagulation parameters like prothrombin time (PT) and activated partial thromboplastin time (APTT). In this study, coagulation parameters were compared in animals fed on low and high conc. of canola oil with that of canola supplemented with atherogenic element. For this purpose, sixty albino rats were selected and divided into five different groups with twelve rats in each group. Group A was given synthetic diet (control) and other four groups (B, C, D and E) were given low and high conc. of canola oil and canola oil + atherogenic elements for 12 weeks duration. Blood samples were collected at $12t^{h}$ week duration in all the groups. PT and APTT were reduced in group containing different conc. of canola oil + atherogenic element when comparing with groups on pure canola oil. The present study shows the beneficial effects of canola oil on coagulation profile. Thus canola oil may be recommended for human consumption in this country to reduce the incidence of ischemic heart disease.

Keywords: Canola oil, PT, APTT

INTRODUCTION

Oils and fats belong to three types of fatty acids, monounsaturated (olive oil, rapeseed oil, canola oil), polyunsaturated (corn oil, soyabean oil) and saturated (hydrogenated oil, butter oil). Chief fatty acids of canola oil, corn oil and rapeseed oil are oleic acid, linoleic acid and erucic acid respectively. Saturated fats mainly contain palmitic acid and stearic acid. Botanical name of canola is the same as that of mustard i.e. brassica campestris. In Pakistan, it is called as sweet sarson. Canola is *characterized by* low level of saturated fatty acids, high level of oleic acid and intermediate level of polyunsaturated fatty acids[1,2,8].

Canola oil, which is mostly monounsaturated fatty acid has a beneficial effect on coagulation when given with atherogenic element. Garlic and omega-3 fatty acids can decrease the platelet aggregation and increase the fibrinolytic activity. These factors are responsible to decrease thrombus formation and also to decrease the platelet aggregation[8].

Polyunsaturated fatty acids also increase the platelet aggregation, which through increase thrombus formation may result in stroke and myocardial infarction. These factors make the intake of monounsaturated fats (such as canola oil, monounsaturated rich sun-flower oil and olive oil) preferable to polyunsaturated fats (such as corn oil, soybean oil and margarine)[4].

Saturated fats and cholesterol in the diet caused rise in serum cholesterol while diets low in saturated fat decreased cholesterol level in human beings, while polyunsaturated fatty diet decrease plasma cholesterol level. Polyunsaturated fatty acids (PUFA) lower triglyceride (TG), very low density lipoprotein cholesterol (VLDL-c), low density lipoprotein cholesterol (LDL-c) and high density lipoprotein cholesterol (HDL-c). Canola oil contains 61% oleic acid and is second to olive oil in oleic acid content. Oils with high oleic acid content reduce total cholesterol. It contains high levels of PUFA than palm or olive oil i.e. 21% linoleic acid and 11% linolenic acid. Canola oil is characterized by a very low level (7%) of saturated fatty acids i.e. palmitic acid, stearic acid. They have been found to increase blood cholesterol level. Major omega-3 fatty acids are alpha-linolenic acid, eicosapentanoic acid (EPA) and docosahexaenoic acid (DHA). They have been shown to lower blood cholesterol and triglyceroide levels. They also reduce the stickiness of blood cells. DHA is required for the development of the eyes and brain of infants. Alpha- linolenic acid helps to reduce the risk of ischemic heart disease and stroke[5,6].

Recent studies show that dietary alpha-linolenic acid (an omega-3 fatty acid found in canola oil) alters the fat composition of cell membranes. There is growing evidence that patients can improve lipid levels and decrease the rate of cardiovascular accidents by adding specific foods to their diets and switching from saturated and polyunsaturated to monounsaturated fats and omega-3 fatty acids. This dietary change decreases arteriosclerotic plaque formation reduces oxidation of LDL and enhance thrombolytic activity[7].

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*APMO, Emergency Lab, Services Hospital, Lahore.
Correspondence to Dr. Akhtar Munir, Assistant Professor, Kohat institute of Medical Sciences, Kohat.

MATERIALS AND METHODS

Sixty albino rats of 8 weeks, weighing from 150-200gm with equal number of males and females were selected for the study. Four different experimental diets were prepared and were given to albino rats for a total period of 12 weeks. The detail of diets is given as follows :-

- Group A was fed synthetic diet (Control diet).
- Group B was fed diet 1 (2.9% canola oil).
- Group C was fed diet 2 (2.9% canola oil supplemented with atherogenic element).
- Group D was fed diet 3 (20% canola oil).
- Group E was fed diet 4 (20% canola oil supplemented with atherogenic element).

Blood samples were taken in the morning after giving ether anesthesia to the albino rats. Samples were collected at 12th week by heart puncture with a sterile disposable syringe. 1.8 ml of blood was put in a test tube containing 0.2 ml of 3.8% sodium citrate (1:9 ratios). This plasma was used for prothrombin time and activated partial thromboplastin time.

RESULTS

The results of PT and APTT in 12th week are given in table 1 and 2.

Table 1: PT in control and experimental groups

PT(sec)	A	B	C	D	E
Mean ± SD	12.1±0.79	14.1±0.98	14.0±1.04	15.9±1.31	14.7±1.07
Total rats	12	12	12	12	12

Statistical Analysis

A vs B p<0.05 (S) A vs C p<0.01 (HS) A vs D p<0.01 (HS)
A vs E p<0.01 (HS) B vs C p>0.05 (NS) D vs E p<0.05 (S)

Table 2: APTT in control and experimental groups

APTT(sec)	A	B	C	D	E
Mean ± SD	40.6±2.73	40.7±2.14	39.1±2.85	42.8±3.04	41.0±2.01
Total rats	12	12	12	12	12

Statistical Analysis

A vs B p>0.05 (NS) A vs C p>0.05 (NS) A vs D p<0.05 (S)
A vs E p>0.05 (NS) B vs C p>0.05 (NS) D vs E p>0.05 (NS)

DISCUSSION

The mean PT of experimental groups B and D was prolonged significantly (p<0.01) as compared to control group. The mean PT of the albino rats in group C and E was raised significantly (p<0.01) at 12th week as compared to control animals. This rise in PT of the animals on canola oil diet (low and high conc.) may be due to effect of omega-3 on coagulation system. Our observations are in accordance with the results of Turner (1990)[3] who also observed similar findings in his experimental study. The mean PT of group D was found to be increased significantly (p<0.05) as compared to that of E at 12th week. It indicated that use of high conc. of canola oil for prolonged period is causing increased PT due to enhanced fibrinolytic system. The mean PT of group E was reduced significantly (p<0.05) than that of group D. This finding can be due to inhibitory effect of atherogenic element on the fibrinolytic system in prolonged use.

The mean APTT of groups B, C and E was comparable with that of control group at 12th week. However, mean APTT of group D was increased significantly (p<0.05) as compared to control group.

This rise in APTT may be due to high contents of canola oil for prolonged period on coagulation system. Turner (1990)[3] while studying the effect of omega-3 on coagulation system also observed enhanced fibrinolysis in experimental animals. At 12th week, the mean APTT of group C vs B and group E vs D was found to be reduced though non-significantly. This reduction in APTT may be attributed to the inhibitory effect of atherogenic element present in diets of groups C and E on coagulation system.

The present study revealed that there was increase in PT and APTT in experimental groups using low and high concentration o f canola (B and D) as compared to those on atherogenic element (C and E) in which there was decrease in PT and APTT.

CONCLUSION

Thus it is concluded that canola oil has beneficial effect on coagulation parameters due to its high contents of monounsaturated fatty acids and omega-3 and may be recommended for human consumption in this country to reduce the incidence of ischemic heart disease.

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