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The Effect of Sesame Oil on Serum Lipids Level in Normochole sterolemic and Hypercholesterolemic Diet-Fed Rats

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Abstract: Most of Sudanese take sesame oil with the popular meal, kidney beans (foul). The average Sudanese consumption of sesame oil with "foul" was found to be 9.58%. In this study, sesame oil was investigated for its effect on serum level of cholesterol, triglycerides, HDL-cholesterol and LDL-cholesterol in normocholesterolemic and hypercholesterolemic diet fed rats. The experiment was divided into two phases, short term treatment (for 7 days) and long term treatment (treatment continued for 28 days). Sesame oil (10%) when administer to hypercholesterolemic diet fed rats increased serum cholesterol and LDL-cholesterol significantly. In normocholesterolemic rats, sesame oil has no significant effect on serum lipids profile.

Key words: Sesame oil, effect, serum lipid, cholesterol

INTRODUCTION

Excessive dietary fat intake has been linked to increase risk of obesity, coronary heart disease and certain types of cancer. The mechanisms by which these are linked are complex, varied and in many instances not clearly understood.

Elevated levels of serum cholesterol and LDL constitute major factors for atherosclerosis and coronary heart disease. The degree of risk of these and other factors may vary according to type and level of fatty acids intakes, percentage of energy from total fat, dietary cholesterol, lipoprotein levels, intake of antioxidants and dietary fiber, activity levels and health status[1]. This prompted us to investigate the effect of sesame oil, which highly consumed by Sudanese people, on serum lipids.

Sesame seed is the seed of *Sesamum indicum Linn*, family *Pedaliaceae*, believed to be indigenous to tropical Africa and cultivated in India, China and Nigeria[2]. Sesame oil is obtained by refining the expressed or extracted oil from the seeds of *Sesamum indicum*. The oil consists of glycerides of oleic, linoleic, palmitic, stearic and myristic acids and also contains a crystalline substance, sesamine, and a phenolic substance sesamol, which gives the red color with a 1% solution of sucrose in strong hydrochloric acid[2].

Sesamum indicum is used as external poultice, emenagogue, lactagogue, emollient, diuretic, tonic and demulcent[3]. Kang MH et al.,[4] reported that sesaminol a major component of sesame oil is a potentially effective antioxidant that can protect LDL against oxidation. Matsumura Y et al.[5] investigated the antihypertensive effect of sesamine, he suggested that sesamine is a useful prophylactic treatment in hypertension and cardiovascular hypertrophy. A marked increase in alpha-tocopherol concentration in the blood and tissue was observed in rats fed an α- tocopherol containing diet with sesame seed or its lignans[6]. Additionally Espin *et al.*,[7] studied the total free radical scavenger capacity (RSC) of 57 edible oils from different sources, they found that only olive, linseed, rapeseed, safflower, sesame, and walnut oils showed significant RSC in the methanolic fraction due to the presence of phenolic compounds.

MATERIALS AND METHODS

Plant material: Sesame oil was obtained from the local market, which was prepared by mechanical expression, to identify sesame oil it was shaken with half its volume with concentrated hydrochloric acid containing 1% of sucrose, which gave pink color (positive test).

Animals: Adult Wister male rats, weighing 100-250 g were used. They were housed in the animal house (Faculty of Pharmacy, University of Khartoum). They were fed normal diet or diet plus 1% cholesterol to produce hypercholesterolemia, (tap water was given ad libitum).

Determination of average Sudanese consumption of sesame oil: Most Sudanese take sesame oil with the

Table 1: Sudanese consumption of sesame oil with beans

Place	No.	Beans (g)	Sesame oil (g)
1	1	285	22
	2	320	23
	3	293	22
2	1	286	37
	2	300	37
	3	268	38
3	1	232	26
	2	218	25
	3	242	29
Total		2444	259
Mean		271.56	28.78
% of Sesame oil			9.58%

popular meal Kidney beans (foul). To determine the average consumption of sesame oil, foul was obtained from three different places that cell foul in Khartoum and sesame oil taken separately then was weighted and the percentage was calculated (Table 1).

Experimental protocol: The experiment was designed to study the effects of sesame oil on serum lipid level in normal and hypercholesterolemic rats, and it was divided into two phases:

Phase I: acute treatment (7days).

Phase II: chronic treatment (28days).

The groups were divided as follows:

A- Normocholesterolemic:

- Group I: fed with normal diet (control).
- Group II: fed with diet containing 10% sesame oil.

B- Hypercholesterolemic:

- Group I: fed with normal diet + 1% cholesterol (control).
- Group II: fed with diet + 1% cholesterol + 10% sesame oil.

Before beginning of the treatment the hypercholesterolemic groups were given only diet + 1% cholesterol for 5 days to ensure that serum cholesterol level was elevated.

The rats were fasted before each blood sampling, then blood samples were taken from the orbital veins, and centrifuged, then the serum was taken to measure cholesterol, TG and HDL using enzymatic colorimetric methods and LDL was then calculated.

RESULTS

Effect of sesame oil (10%) on serum lipid level in hypercholesterolemic diet fed rats: When sesame oil (10%) administrated for 7 days for hypercholesterolemic diet fed rats, serum cholesterol level was increased significantly in treated group ($p<0.05$), while there was no significant change in the control group. When treatment was continued for 28 days, serum cholesterol level was increased significantly in both treated and control group ($p<0.05$).

Sesame oil (10%) has no significant effects in the serum triglycerides. There was no significant change in serum HDL-cholesterol in the treated group, while the control group increased significantly ($p<0.05$) when cholesterol was added for 7 days. Serum

Table 2: Effect of sesame oil (10%) on serum level of Cholesterol (chol.), Triglyceride (TG), High Density Lipoprotein Cholesterol (HDL) and Low Density Lipoprotein Cholesterol (LDL) in hypercholesterolemic diet fed rats

		Chol.		TG		HDL		LDL	
Dose	Blood samples	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
Sesame oil 10%	After add. of chol	59	2.05	78.6	3.94	31.6	7.44	19.5	3.30
	After 7 days treat	82.6*↑	13.19	80.4	7.22	33.8	2.20	40.75	10.91
	After 28 days treat	138*↑	7.64	79.8	4.93	23	1.52	99.00*↑	7.84
Control	After add. of chol	66.6	12.36	93.6	10.10	25.6	1.75	29.75	13.92
	After 7 days treat.	66.4	7.08	63.4	2.68	39.6*↑	4.14	19.00	11.37
	After 28 days treat.	101.6*↑	16.25	107.0	18.99	34.6	6.35	45.6	15.56

*↑ significant increase P< 0.05 ANOVA

Table 3: Effect of sesame oil (10%) on serum level of Cholesterol (chol.), Triglyceride (TG), High Density Lipoprotein cholesterol (HDL), and Low Density Lipoprotein cholesterol (LDL) in normocholesterolemic diet fed rats

		Chol.		TG		HDL		LDL	
Dose	Blood samples	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
Sesame oil 10%	Normal	58.4	2.23	34.8	1.62	40.4	5.73	20.0	7.77
	After 7 days treat.	51.6	4.27	54.6*↑	4.03	38.0	3.74	9.33	3.28
	After 28 days treat	53.4	1.99	43.2	3.23	41.2	1.53	4.90	2.41
Control	Normal	53.8	6.33	44.8	6.32	44.25	3.42	5.45	2.98
	After 7 days treat.	53.4	2.01	86.8*↑	18.88	36.0	4.11	5.00	09.1
	After 28 days treat	61.0	2.92	55	4.39	46.2	1.83	5.80	2.65

*↑ significant increase $p < 0.05$ ANOVA

LDL- cholesterol level was increased significantly ($p<0.05$) in the treated group when sesame oil was given for 28 days (Table 2).

Effect of sesame oil (10%) on serum lipids level in normocholesterolemic rats: Sesame oil (10%) has no significant effect on serum lipids profile in normocholesterolemic rats (Table 3).

DISCUSSION

Most of Sudanese take sesame oil with the popular meal, kindly beans (foul), the average Sudanese consumption of sesame oil with 'foul' was found to be 9.58%. Therefore this study is an attempt to study the effect of sesame oil (10%) on serum lipids profil, because excessive dietary fat intake has been linked to increased risk of coronary heart disease.

Hypercholesterolemic rats, when treated with sesame oil (10%) for 7 days and 28 days, serum cholesterol level was increased significantly ($p< 0.05$), while the control group increased only on day 28 due to addition of cholesterol in the diet, serum LDL- cholesterol also increased significantly when treatment was continued for 28 days in hypercholesterolemic diet fed rats. These results indicate that sesame oil did not prevent the increase in serum cholesterol level in rats due to addition of cholesterol in the diet, and supported the findings reported by Eltahir[8], who reported that sesame oil did not prevent the increase in blood cholesterol level in hypercholesterolemic diet fed rats.

Further investigations should be conducted to study the effects of sesame oil since it is extensively consumed by the Sudanese.

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