ORIGINAL ARTICLE

Hypolipidemic Effects of Nigella Sativa in Albino Rats

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ABSTRACT

Aim: To determine hypolipidemic effects of N. sativa in albino rats

Methodology: In present study changes in the serum lipid levels of albino fed on sunflower oil were investigated. Among 48 (24 control group and 24 treated group) albino rats divided into 4 groups for both control and treated; named A, B, C, D and fed on low fats (3%) sunflower oil diet and high fats (20%) sunflower oil diet with and without N. sativa for 24 weeks. Fourteen days after adaptation to the environment and maintenance diet, fasting blood samples (zero) were collected and these diets were started and fed for 24 weeks. At 12th week, blood samples were again taken and final samples were collected at 24th week.

Results: The study revealed that rats fed on low fats sunflower oil diet had no significant changes in plasma lipid. N. sativa supplementation in low fats sunflower oil group showed a highly significant increases ($p<0.001$) in plasma HDL- C levels. Total cholesterol (TC), LDL- C, phospholipids and total lipids were lowered very highly significant ($p<0.001$) while HDL and TG levels lowered significantly ($p<0.05$) and highly significantly ($p<0.01$) respectively in high fats sunflower oil diet groups. N. sativa supplemented high fats sunflowers oil diet significantly increase ($p<0.05$) HDL and lowered LDL in comparison with high fats sunflower oil diets alone.

Conclusion: Dietary supplementation of N. sativa (Kalonji) has hypolipidemic effect by enhancing HDL and lowering LDL level in rats fed on diet rich in poly-unsaturated fatty acid.

Keyword: *Nigella sativa,* albino rats, Low and High Density Lipoprotein Cholesterol, Triglyceride, Total cholesterols, Phospholipids

INTRODUCTION

Atherosclerotic cardiovascular and cerebrovascular diseases are the major cause of mortality and morbidity both in the developed and developing countries[1]. Hyperlipidemia, a major risk factor of cardiovascular disease (CVD) is an alarming public health problem in the World. Several clinical & epidemiological studies have indicated the major role of hyperlipidemia in pathogenesis of atherosclerosis[2]. Hyperlipidemic states especially hypercholesterolemia have been under consideration as etiological & pathogenic factor for CVD for a long time. In recent past hyperlipidemic states have been regarded as a disease entity. Many studies have found positive correlation between atherosclerosis and high levels of serum low density lipoprotein (LDL) and negative correlation with high density lipoprotein (HDL)[3]. High levels of serum triglycerides are also considered to be a major risk factor in the pathogenesis of CVD[4]. The association of elevated levels of plasma lipids with CHD necessitates a search for safe and effective lipid lowering agents. Physiologically a dietary approach to the problem would be more desirable than the use of drugs. Nigella sativa (N. sativa) is an annual herb plant belonging to the botanical family of Ranunculacea[5]. Its seeds contain alkaloids, fixed and volatile oils and variety of pharmacologically active substances[6]. N. sativa Linnaeus commonly known as black seed or black cumin have been used in the Southeast Asia, Middle and Far East as a natural remedy to treat many diseases including asthma, hypertension, diabetes, hypercholesterolemia, inflammation, arthritis, tumours, gastrointestinal disturbances and gynaecological disorders for over 2000 years[7].Oils and fats, essential elements in the human diet function as an important energy source. The butter and animal fats are saturated while vegetable oils may be saturated and unsaturated[8]. Olive oil predominantly contains monounsaturated fatty acids (MUFAs) whereas corn, soya beans, cotton seeds and sunflower oils are rich in polyunsaturated fatty acids (PUFAs)[9]. The present study aims to evaluate the effects of N. sativa on serum lipid levels in albino rats fed on sunflower oil diet.

MATERIAL AND METHOD

The study was carried out at Postgraduate Medical Institute, Lahore. It was an experimental randomized trial. Simple random sampling technique was used. A

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total of 48 (12 in each group) samples were tested. Study population consisted of healthy albino rats of 8 weeks age, weighing 125-150 gram each. Clinically abnormal albino rats were excluded.

The study population of 48 rates of both sexes were randomly divided into four groups (A, B, C, D), 12 rats each. The albino rats were maintained under optimum atmospheric and hygienic conditions. Both food and water were made available at all the times. Animals were weighed at the start of the experiment (zero week) and then at 12th and 24th week.

Four different types of diets were prepared as shown in Table 1.Fourteen days after adaptation to routine diet the first blood sample (0 week) was collected. Experimental diets were started and the second blood sample was taken at 12th week and final blood sample was collected at the end of study i.e., 24th week. The blood samples were analysed for serum TC, HDL, LDL, triglyceride (TG), phospholipids (PL) and total lipids (TL).Group A and group C were given low fat sunflower oil diet (3%) and high fat sunflower diet (20%) respectively while group B and D were fed N. sativa supplemented with 3% and 20% sunflower oil diet respectively.

RESULTS

All the groups of animals showed weight gain as compared to the base line weight. The changes in lipid profile parameters during study are shown in Table 2. The weight gain was very highly significant (P-value<0.001).The levels of serum TC, HDL, LDL, TG, PL, and TL in different groups at zero weeks were compared with those at 12th and 24th week. The low fat sunflower oil diet had non-significant change in the serum lipid level of group A at 12th and 24th week. N. sativa supplemented low fats sunflower oil diet in the group B produced significant increase in serum HDL while increase in TC, LDL, TGs, TL and PL was non-significant. High fats sunflower oil diet in group C showed significant decrease in serum TC, HDL, LDL, TG, PL and TL. N. sativa supplemented high fat diet significantly increased HDL and lowered LDL in comparison with high fats sunflower oil diet alone (Table 2.).

Table 1. Different diets fed to various groups of rats

Group	No. of animals	Diets fed
A	12	1 (3% sunflower oil diet)
B	12	2 (3% sunflower oil diet +N. sativa)
C	12	3 (20% sunflower oil diet)
D	12	4 (20% sunflower oil diet +N. sativa)

Table 2: Lipid profile of rats at 12 and 24 weeks

		At 12 weeks					
		TC (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	TG(mg/dl)	PL(mg/dl)	TL (mg/dl)
Study group	A	74.96±3.8	21.93±2.1	37.12±3.1	84.39±6.4	149.8±13.6	470.38±14.5
	B	73.44±6.9	22.82±2.5	35.21±4.3	82.69±4.9	154.7±11.8	468.46±15.6
	C	67.75±6.9	20.69±3.9	30.85±3.5	78.68±6.6	142.5±11.9	436.89±13.1
	D	66.24±5.8	22.04±2.9	27.73±3.5	73.18±8.2	155.9±11.0	429.01±11.7
		At 24 weeks					
Study group	A	75.66±4.1	22.29±2.1	37.72±3.2	84.88±6.9	150.2±13.3	471.50±14.7
	B	74.65±6.1	24.76±1.9	36.31±4.4	83.39±4.2	155.9±11.9	470.2±14.8
	C	60.86±7.0	18.44±3.7	27.70±3.2	74.33±7.0	134.5±12.9	418.91±13.2
	D	60.46±5.1	21.66±3.2	24.41±3.9	71.04±7.3	136.4±10.5	416.04±9.0

DISCUSSION

The present study showed highly significant weight gain in all the groups of albino rats compared with baseline levels. Low fats sunflower oil diet had a small increase in serum TC, LDL, HDL, TGs, PL and TL which was statistically non-significant. These result are in agreement with those of Fillios *et al* and Joris et al[10,11]. N. sativa supplemented low fats sunflower oil diet highly significantly increase HDL, which is in conformation with the finding reported by Choudhary[12] who found that N. sativa raised HDL and lowered LDL in albino rats fed on low fat diet. High fat sunflower oil diet group showed decrease in mean serum TC and LDL. Several studies conducted in rats by different workers showed similar results[13,14,15].

Multiple mechanisms of action may in fact contribute to the lipid-lowering effects of *N. sativa*. It may contribute in cholesterol synthesis through regulation of HMG-Co A reductase, Apo-A1, Apo-B100 and LDL-receptor genes. This effect is mediated by its constituent bioactive substances such as thymoquinone etc[16,17]. Dietary soluble fibers[18] and sterol[19] of N. sativa probably contribute to its lipid lowering activity. The possible mechanism may involve decreased dietary absorption of

cholesterol, stimulation of primary bile acid synthesis and its fecal losses.

Antioxidants also partly contribute to the overall functional effects of *N. Sativa*. Particularly, antioxidants like flavonoids have been proposed to decrease cholesterol synthesis and suppress reactive oxygen species and nitrogen species formation. It may protect the antioxidant defence system[17]. Some workers have observed beneficial effects of N. sativa on glycemic control in patients with type 2 diabetes and metabolic syndrome[20,21]. Large size studies on human beings are required to further elucidate the effects of Kalonji on different body systems.

CONCLUSION

The present study shows that N. sativa supplemented high fat sunflower oil diet group showed a high significant decrease in all the lipid fractions except HDL which was decreased non-significantly. This directly reflects the HDL enhancing effects of N. sativa.

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