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NIGELLA SATIVA (KALONJI); EFFECTS ON SERUM CHOLESTEROL OF ALBINO RATS

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ABSTRACT: The increased level of LDL-c in the serum has a high risk and the increased serum HDL-c level has a low risk for the development of atherosclerosis. The effect of Nigella Sativa on levels of cholesterol fractions were determined in this study on rats. **Methods:** 24 albino rats of 08 weeks age having equal number of males and females were kept at optimum atmospheric condition. The blood samples were taken at the start and different control and experimental diets were given for 24 weeks. The experimental diets were added with Nigella Sativa as 30 mg/kg body weight. The blood samples were taken at the end of study. The blood samples drawn at the start and end of the study were estimated for serum cholesterol. The results of control and experimental groups were compared. **Results:** Total serum cholesterol in the control group showed increase from 8.3±3.30 to 13.96±9.3 at 24 weeks. The serum HDL cholesterol showed increase from 44.4±6.12 to 80.45±5.95 level at 24 weeks. The serum LDL cholesterol showed increase from 8.3±3.30 to 13.96±9.3 at 24 weeks. The total serum cholesterol in experimental group was increased from 76.9±6.5 to 117.5± 6.65 at 24 weeks. The serum HDL cholesterol levels was increased from 41.7±4.9 to 83.42±5.92 at 24 weeks as compared with control group. The LDL cholesterol levels were decreased from 12.7±6.9 to 8.5±7.8 at 24 weeks. Conclusions: This study shows significant decrease in serum low density lipoprotein cholesterol level, and increase in serum high density lipoprotein cholesterol levels.

Key word: Nigella Sativa, Serum Cholesterol, Rats

INTRODUCTION

Coronary heart disease (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[1]. It is the cause of 25-30% of deaths in most industrialized countries[2]. The major cause of CHD is atherosclerosis with reference to major and minor etiological and pathogenetic factors associated with atherosclerosis, hyperlipidemic states especially hypercholesterolemia have been under consideration on a large scale[3]. In recent past hyperlipoproteinemia states have 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[4]. Diets containing monounsaturated fatty acids (like olive oil) have been known to increase serum HDL-c and decrease LDL-c levels[5]. Where as polyunsaturated oils (corn oil) have been referred to decrease both serum LDL-c and HDL-c levels[6].

Nigella sativa is a pretty herb, seeds of which are commonly known as kalonji[7]. Its chemical composition is moisture 7.43%, ash 4.14%, fixed oil 37%, volatile oil 1.64%, albumin 8.2%, mucilage1.9%, organic acid precipitated by copper 0.38%,metarabin 1.36%, melanthin 1.4%, cellulose 8.32%, sugar 2.75%, arabic acid 3.41% and other substances dissolved by soda 9.38%[8].

It was used as powder and ethanolic extracts in children under 12 years of age for antinematodal and anticestodal effects and observed significant antinematodal and anticestodal effects[9].

Its ethanolic extract was used in malignant ulcers of cheek in hospitalized patients and it healed ulcers. The extract was also used to observe cytotoxic effect in albino mice and found it as an effective anticytotoxic agent[10].

Its different fractions (extracts) were used in Rabbits to observe its effects in whole blood clotting and plasma clot time. In vitro it significantly shortens bleeding time, partial thromboplastin time, prothrombin time and thrombin time. In vivo it shortened bleeding time and partial thromboplastin time but prothrombin time and thrombin

time remained unaffected[11].

Its active principles thymoquinone and poly-thymoquinone were used in rats, dogs and guinea pigs to observe its uricosuric, antihistamine and choleratic activity and it was concluded that it is good uricosuric, strong antihistamine and increased bile excretion[12].

This increased bile excretion was stimulus, to plan this study to see the effect of Nigella sativa on serum cholesterol of albino rats.

MATERIAL AND METHODS

Twenty eight albino rats of about eight weeks age, including equal number of males and females were distributed into two groups of 14 rats each. The animals were numbered and kept as same sex in iron cages.

The animals were kept under optimum temperature (24±2OC) and hygienic conditions with food and water available at all time. A synthetic diet was started for initial two weeks. The control (D1) and experimental (D2) diets were started after taking 12-14 hour fasting blood. The other sample was taken after twenty weeks with same protocol. Both samples were estimated for total cholesterol, high density lipoprotein cholesterol and low density lipoproteins cholesterol.

RESULTS

The total serum cholesterol in the control group showed increase from 8.3±3.30 to 13.96±9.3 at 24 weeks. The serum HDL cholesterol showed increase from 44.4±6.12 to 80.45±5.95 level at 24 weeks (Table 4). The serum LDL cholesterol showed increase from 8.3±3.30 to 13.96±9.3 at 24 weeks. The total serum cholesterol in experimental group was increased from 76.9±6.5 to 117.5± 6.65 at 24 weeks. The serum HDL cholesterol levels was increased from 41.7±4.9 to 83.42±5.92 at 24 weeks as compared with control group. The LDL cholesterol levels was decreased from 12.7±6.9 to 8.5±7.8 at 24 weeks.

DISCUSSION

In this study the serum total cholesterol and high density lipoprotein cholesterol were increased and serum low density lipoprotein cholesterol level was decreased.

Table-I. Percentage composition of synthetic diet

Ingredients	%age
Wheat starch	62.1
Casein	20.0
Glucose	10.0
Choline & methionone	0.5
Mineral mixture	3.5
Vitamin mixture	1.0
Fat	2.9

These results suggest that nigella sativa has a protective role in atherosclerosis and that is due to its hypolipidemic activity. This has been obtained previously in other studies like in a study conducted in Canada to see the effect of Petroleum ether extract of nigella sativa exert lipid lowering and insulin sensitizing action in the rats. At the end of four weeks of treatment nigella sativa treated rats had lowered Triglycerides and higher HDL cholesterol[13]. In other study conducted at Egypt to see the influence of Thymoquinone (Active ingredient of nagella sativa seeds) on Doxorubicin-induced hyperlipidemic nephropathy in rats, results showed rats treated with Thymoquinone (10mg/kg/day) for five days significantly lowered serum urea, Triglycerides and total cholesterol[14].

In study conducted at A.M.U Aligarh total cholesterol was reduced in both the groups, reduction was more in Nigella Sativa group, improvement in HDLc was significant in nigella sativa group. LDLc s reduced in both groups but the reduction was significantly more in nigella sativa group[15]. One study conducted at postgraduate medical institute Lahore total cholesterol and LDLc and triglycerides were reduced and HDL was increased.

In an other study conducted at Egypt, the nigella sativa oil was administered (800mg/kg) for four weeks and showed significant decrease in serum total cholesterol, low density lipoprotein cholesterol, triglycerides and significant elevation of serum high density lipoprotein level[16]. Several other studies conducted at different places on the rats showed the same pattern of results.

Table-II. Percentage composition of control and experimental diet.

Ingredients (mg/dl)	D_1	D_2
Wheat starch	62.1	62.1
Casein	20.0	20.0
Glucose	10.0	10.0
Choline & methionone	0.5	0.5
Mineral mixture	3.5	3.5
Vitamin mixture	1.0	1.0
Fat	2.9	2.9
Kalonji (30mg/kg body wt.)	-	+

Table-III. Comparison of mean serum cholesterol levels (mg/dl) between 0 to 20 weeks

Groups	Male 0weeks	Male 20weeks	Female 0week	Female 20week	Total 0week	Total 20weeks
Control	77.10±5.90	121.63±5.16*	74.45±5.52	122.48±3.58*	75.80±5.63	122.06±4.26*
Exper.	75.30±5.85	119.31±5.31*	78.48±7.15	115.68±7.80*	76.9±6.5	117.5±6.65*

P< 0.001 * Highly Significant

Table-IV. Comparison of mean HDL-c levels (mg/dl) between 0 to 20 weeks

Groups	Male 0weeks	Male 20weeks	Female 0week	Female 20week	Total 0week	Total 20weeks
Control	44.42±6.36	80.48±6.636*	44.43±4.12	80.47±6.12*	44.4±5.11	80.45±5.95*
Exper.	42.77±6.10	80.82±6.88*	40.17±3.40	86.00±3.81*	41.7±4.9	83.42±5.92*

P< 0.001 * Highly Significant

Table-V. Comparison of mean serum ldl-c levels (mg/dl) between 0 to 20 weeks

Groups	Male 0weeks	Male 20weeks	Female 0week	Female 20week	Total 0week	Total 20weeks
Control	9.43±2.52	14.08±10.94*	7.15±3.98	13.79±7.71*	83.0±3.33	13.96±9.3*
Exper.	9.55±4.70	12.59±8.07*	15.88±7.71	4.43±2.97*	12.7±6.9	8.5±7.8*

P< 0.001 * Highly Significant

Nigella sativa seeds are the common drug used in Ayurvedic system of medicine through out the world. In a clinical trial planned to evaluate the anti-hypercholesterolemic activity of the Baraka oil (kalonji oil) in hypercholesterolemic patients. Seventeen hypercholesterolemic patients (with mean age of 53years) were administered Baraka oil (2.5ml) in the morning and evening for four weeks. At the end of trial

total cholesterol fell by 20% to 208mg/dl, LDL cholesterol levels were reduced to 118mg/dl and HDL cholesterol levels were reduced to 73mg/dl.

Lowering of the total and LDL cholesterol will also reduce their ratio with HDL cholesterol, thus reducing the risk for coronary artery diseases. This could be an important step in the prevention and management of hypercholesterolemia.

CONCLUSIONS

On the basis of these findings it is concluded that nigella sativa produces antiatherogenic effect by decreasing low density lipoprotein cholesterol level significantly. It also increases high density lipoprotein cholesterol level. Thus nigella sativa prevents atherogenesis by decreasing LDL-c.

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PREVIOUS RELATED STUDIES

- Serum lipid profile; correlation of nigella sativa and sunflower oil diet intake in albino rats. Muhammad Anwar Buriro, Muhammad Tayyab. Professional Med J Dec 2008; 15(4): 500-507