

## Effect of Shilajit on Lipid Profile of Hyperlipidemic Albino Rats and Comparison with Simvastatin

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### ABSTRACT

**Objective:** To find out the effect of Shilajit on lipid profile of hyperlipidemic albino rats and comparison with simvastatin.

**Study design:** It is a case-controlled interventional study of eight weeks' duration. 30 adult male albino rats weighing about 220-250g divided randomly into three groups A, B, and C. Hyperlipidemia was induced in B and C; afterwards drugs, Shilajit and simvastatin were given. Blood samples of all groups for lipid profile were evaluated at 0, 4, and 8 weeks.

**Results:** It was found that the Shilajit has beneficial effect on lipid profile, comparable to that of simvastatin.

**Keywords:** Shilajit, Simvastatin, Lipid Profile.

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### INTRODUCTION

Cardiovascular diseases are the most common cause of death in industrial countries around the world<sup>1</sup>. Causing 1 in every 5 deaths in the year 2000 in United States<sup>2</sup>. The important modifiable risk factors that provide opportunity for individuals and population to reduce their likelihood of CHD (coronary heart disease) are cigarette smoking, obesity, diabetes mellitus, high blood pressure and high blood cholesterol<sup>3</sup>. A number of metabolic disorders that involve elevation in levels of any of the lipoprotein species are thus termed hyperlipoproteinemias or dyslipidemia<sup>4</sup>. Commonly used agents for treatment of dyslipidemia are (1) bile acid binding resins (cholestipol and cholestyramine), (2) fibric acid derivative (gemfibrozil and clofibrate), (3) niacin and (4) HMG-COA reductase inhibitors (statins). HMG-COA (3-hydroxy-3methyl glutaryl co-enzyme A) reductase inhibitors (statins) are known to be the most powerful and most commonly used lipid lowering group of drugs. They inhibit the rate limiting step of cholesterol synthesis, reduce the level of cholesterol and triglycerides and is claimed to raise HDL level<sup>5</sup>. Therapy with lipid lowering agents involves multiple risk factors and adverse effects. Statins are known to be associated with various adverse effects like myopathy, rhabdomyolysis, pancreatitis, increased level of creatin kinase, bone marrow depression, hepatotoxicity, muscle toxicity can prove fatal<sup>6</sup>.

Many herbs are known to lower cholesterol and LDL, Shilajit is one of them. The Latin name of Shilajit is *Asphaltum*<sup>7</sup>. In Sanskrit it means "conqueror of mountains and destroyer of weakness". It is a blackish brown exudate found in the surroundings of Himalayas. It is also found in the rocky mountains of Zarlek, Badekshan, Afghanistan, Bhutan, China, Nepal, Pakistan, Tien Shah and some regions of former USSR as well as in Norway<sup>8</sup>. Shilajit synonymous with shilajatu (Shila, Rock, Jatu, and what Adheres to) is usually collected on the ground or found flowing out from between fissures in the rocks. In its raw form, shilajit is a semi hard brownish black to dark, greasy black water soluble resin that has a distinctive smell and bitter in taste<sup>9</sup>.

Shilajit is composed of humus and organic plant material that has been compressed by layers of rock mixed with microbial metabolites. It contains more than 85 minerals in ionic form and humic substances. The active constituents consist of carrier molecules; fulvic acid, humic acid, dibenzo-alpha-pyrones and related metabolites, small peptides (constituting non protein amino acids) and some lipids. Fulvic acid is the most powerful natural electrolyte<sup>7</sup>. Shilajit has been attributed with many miraculous healing properties. It has been used historically for general physical strengthening, anti-aging, to enhance libido, injury healing, bone healing, immune system strengthening, arthritis, hypertension, diabetes mellitus and obesity<sup>10</sup>. In one study it was shown to improve lipid profile of diabetic rats in dose dependent manner<sup>11</sup>. So the present study was designed to observe the antihyperlipidemic effect of Shilajit in comparison with simvastatin on hyperlipidemic albino rats.

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## MATERIALS AND METHODS

**Test Material:** Brownish black (Luha) shilajit, the pharmacologically effective form<sup>12</sup> was obtained from PCSIR. Shilajit is soluble in distilled water. Freshly prepared aqueous extract of Shilajit was used and dose was 100 mg/kg. Simvastatin tablet was crushed and dissolved in distilled water and used in a dose of 0.1mg/kg.

**Diet for albino rats:** Normal diet: Normal rat chow available in the market.

Hyperlipidemic diet: 20% sunflower oil, 1% cholesterol and 0.3% sodium cholate were added to normal diet.

**Methodology:** 30 male albino rats were divided randomly into 3 groups, ten rats in each group. The groups were; A control, B and C experimental groups. Initially all the groups were fed on normal rat chow and water *ad libitum* for acclimatization period of two weeks. Then group B and C were fed on hyperlipidemic diet throughout the study. Animals were given food at 8.00 and 14.00 and 20.00 hrs. Diet was prepared on weekly basis at the rate of 30gm of diet/day/animal.<sup>13</sup> After the period of 04 weeks group B and C were administered Shilajit and simvastatin respectively. Blood samples for lipid profile were evaluated at 0, 4, and 8 weeks. Before taking samples animals were kept fasting for 12-14 hours but had free access to water. Blood was collected by cardiac puncture giving light anesthesia.

**Parameters:** Lipid profile

- Total serum cholesterol
  - Triglycerides
  - High density lipoprotein HDL-C
  - Low density lipoprotein LDL-C
- Lipid profile was estimated by Dade Behring Dimension Kits

**Data analysis:** All numerical variables were represented as mean  $\pm$  standard deviation. ANOVA test was used for comparison of all groups simultaneously. The individual comparison between any two groups was analyzed by tukey's test. P-value less than 0.05 were considered significant. All analysis was done through the statistical package SPSS Version 15.0.

## RESULTS

The animals in the study were of the weight between 220 and 250 grams and were assigned to the three groups at random. The average weight for control group, group allocated Shilajit and the group allocated Simvastatin were  $240.6 \pm 4.8$ ,  $235.2 \pm 10.8$

and  $240 \pm 7.8$  g respectively. Lipid profile was estimated at 0,4 and 8 weeks.

**Total cholesterol:** Table 1 shows comparison of total cholesterol at 0, 4 and 8 weeks in all 3 groups. At 0 week results are insignificant showing total cholesterol in all three groups is almost same. At 4 week results show a significant increase in cholesterol levels of groups B and C after hyperlipidemic diet. Total cholesterol increased from  $55.3 \pm 3.47$ mg/dl to  $105.3 \pm 2.83$ mg/dl in group B and  $54.7 \pm 4.13$ mg/dl to  $108.6 \pm 3.02$ mg/dl in group C. At 8 week total cholesterol level decreased to  $68.7 \pm 3.46$ mg/dl in group B and  $55.5 \pm 4.9$ mg/dl in group C. So at 8 week pairwise comparison of groups B and C is insignificant showing that both the drugs are equally effective in lowering blood cholesterol but not to the extent of baseline.

**Triglycerides:** At zero week mean triglyceride levels were nearly same in all groups. At 4 week triglyceride levels were increased in both B and C groups from  $105.2 \pm 3.1$ mg/dl to  $144.9 \pm 3.98$ mg/dl and  $105 \pm 4.32$  to  $147.10 \pm 3.87$  respectively. Pair wise comparison of B and C was insignificant as shown in table 2. At 8 week the level of triglyceride reduced remarkably to  $104.9 \pm 4.88$  mg/dl in group B and  $105.2 \pm 4.36$ mg/dl in group C but pair wise comparison of both these groups is insignificant showing that both these drugs almost equally lower triglyceride levels close to the baseline levels.

**HDL:** Table 3 shows comparison of HDL levels of all groups at 0, 4 and 8 weeks. Difference was insignificant at 0week. At 8 weeks after administration of drugs the HDL level was raised to  $22.2 \pm 4.57$ mg/dl in group B and  $28.9 \pm 1.72$ mg/dl in group C and Pair wise comparison of both these groups to normal control group is significant showing that both these drugs increase HDL level. Pair wise comparison of group B and C shows that simvastatin is more effective in increasing HDL levels.

**LDL:** At zero weeks the LDL levels were nearly the same in all groups. At 4 week LDL levels increased from  $15.5 \pm 3.85$ mg/dl to  $51.42 \pm 3.69$ mg/dl in group B and from  $16.7 \pm 6.95$ mg/dl to  $50.28 \pm 3.63$ mg/dl in group C (table 4). Pair wise comparison of these groups with normal control is significant. At 8 week the LDL levels decreased in both groups B and C to  $24.4 \pm 6.4$ mg/dl and  $15.06 \pm 4.50$ mg/dl respectively. Pairwise comparison of group B and C is significant showing that simvastatin is more effective in lowering LDL nearly to the baseline as compared to shilajit

Table 1: Pairwise comparison of total cholesterol (mg/dl) of three groups at baseline, 4<sup>th</sup> and 8<sup>th</sup> week

(I) group	(J) group	Base line		4 <sup>th</sup> week		8 <sup>th</sup> week	
		Mean Difference (I-J)	Sig.	Mean Difference (I-J)	Sig.	Mean Difference (I-J)	Sig.
A "Control"	B " Shilajit "	0.4	0.967	-50.5(*)	<.001	-14.3(*)	<.001
	C "Simvastatin"	0.8	0.875	-53.8(*)	<.001	-11.7(*)	<.001
B "Shilajit "	C "Simvastatin"	0.4	0.967	-3.3	.055	2.6	.351

\*The mean difference is significant at the .05 level.

Table.2: Pairwise comparison of triglysrides (mg/dl) of three groups at baseline, 4<sup>th</sup> and 8<sup>th</sup> week

(I) group	(J) group	Base line		4 <sup>th</sup> week		8 <sup>th</sup> week	
		Mean Difference (I-J)	Sig.	Mean Difference (I-J)	Sig.	Mean Difference (I-J)	Sig.
A "Control"	B " Shilajit "	-0.4	0.967	-39.3(*)	<0.001	-2.1	0.553
	C "Simvastatin"	-0.3	0.981	-41.5(*)	<0.001	-0.4	0.978
B "Shilajit"	C "Simvastatin"	0.1	0.998	-2.2	0.453	1.7	0.676

\*The mean difference is significant at the .05 level.

Table.3: Pairwise comparison of HDL cholesterol (mg/dl) of three groups at baseline, 4<sup>th</sup> and 8<sup>th</sup> week

(I) group	(J) group	Base line		4 <sup>th</sup> week		8 <sup>th</sup> week	
		Mean Difference (I-J)	Sig.	Mean Difference (I-J)	Sig.	Mean Difference (I-J)	Sig.
A "Control"	B " Shilajit "	-.3	0.892	-6.4(*)	<0.001	-3.6(*)	0.027
	C "Simvastatin"	-.8	0.453	-.9	0.708	-10.3(*)	<0.001
B " Shilajit "	C "Simvastatin"	-.5	0.729	5.5(*)	<0.001	-6.7(*)	<0.001

\*The mean difference is significant at the .05 level.

Table 4: Pair wise comparison of LDL Cholesterol (mg/dl) of three groups at baseline, 4<sup>th</sup> and 8<sup>th</sup> week

(I) group	(J) group	Base line		4 <sup>th</sup> week		8 <sup>th</sup> week	
		Mean Difference (I-J)	Sig.	Mean Difference (I-J)	Sig.	Mean Difference (I-J)	Sig.
A "Control"	B " Shilajit "	0.9	0.936	-36.2 (*)	<0.001	-10.3(*)	<0.001
	C "Simvastatin"	0.9	0.936	-35.1(*)	<0.001	-0.9	0.920
B "Shilajit"	C "Simvastatin"	0.0	1.000	1.1	0.716	9.4(*)	<0.001

\*The mean difference is significant at the .05 level.

## DISCUSSION

Even after major advances in medical field, hyperlipidemia and its complications remain to be one of the major health problems affecting the human society. Available lipid lowering agents are expensive, have many adverse effects and may need to be given for decades; thus their cost effectiveness is generally low.<sup>14</sup> Physicians are looking for better control of hyperlipidemia which must be economical and devoid of side effects. Many natural products are being used for this purpose, Shilajit is one of them<sup>15</sup>.

Upon reviewing the accumulated data especially that pertaining to shilajit's lipid lowering action, the current study was designed to establish antihyperlipidemic effect of Shilajit in hyperlipidemic

albino rats. The results show that Shilajit effectively lowers total cholesterol, triglycerides and LDL. When compared to simvastatin; both the drugs are equally effective in lowering total cholesterol and triglyceride levels but simvastatin is found to be more effective in lowering LDL and raising the level of HDL.

The exact mechanism of decreasing the fat content is not fully understood, it was proposed that Shilajit might have some direct effect on lipid profile<sup>11</sup>. It was also proposed that humic acid, a constituent of Shilajit may show antiatherogenic effect by inhibiting the lipopolysaccharide induced expression of vascular cell adhesion molecule<sup>16</sup>. Shilajit is also known to have antioxidant property like simvastatin.

## CONCLUSION

Shilajit being an antioxidant and antihyperlipemic herbomineral agent is worthwhile to use in hyperlipidemia. But more research is required on pharmacokinetic and pharmacodynamic aspects and in combination with other antihyperlipidemic drugs clinically.

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