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Research Paper

Comparative study of *Ocimum sanctum* with pravastatin in diabetic hyperlipidemic rats

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ABSTRACT

Diabetes mellitus is a disorder of the metabolic homeostasis controlled by insulin, resulting in abnormalities of carbohydrate and lipid metabolism. Diabetes induced metabolic abnormalities are responsible for hyperlipidemia as well as hyperglycemia. Hyperlipidemia and Highperglycemia is induced by Cholesterol diet and Strptozotocin to the rats. When compared Ocimum and pravastatin has good hypolipidemic activity. Ocimum also reduses blood glucose level in the animals.

Key Words- *Ocimum sanctum (O.S.)*, Hyperglcmia, hyperlipideia, strptozotocin.

INTRODUCTION

Diabetes mellitus (DM) is a progressive disease with risk factors for both macrovascular and microvascular complications. [1] The long-term effects of DM include progressive development of specific long-term complications of retinopathy with potential blindness, nephropathy that may lead to end-stage renal failure, and/or nephropathy with the risk of foot ulcers, amputation, Charcot's joints, and feature of autonomic dysfunction, including sexual dysfunction. [2, 3] A defective or deficient insulin secretary response, which translates into impaired carbohydrate (glucose) use, is a characteristic feature of diabetes mellitus, as is the resultant hyperglycemia. Diabetes induced metabolic abnormalities are responsible for hyperlipidemia as well as hyperglycemia. [4] Diabetes mellitus despite the increased risk of atherosclerosis, levels of serum cholesterol, triglycerides, low-density-lipoprotein (LDL) cholesterol, and high-density-lipoprotein (HDL) cholesterol. The likely changes in LDL density and particle size resulting from this compositional abnormality might lead to accelerated atherogenesis analogous to that seen hyperlipoproteinaemia. In addition, there was an increase in the concentration of cholesterol in the smaller, denser, HDL sub fraction of serum HDL in IDDM. [5-7] Natural products are a source of synthetic and traditional herbal medicine and are still the primary health care system. Many plants have been reported for hypolipidemic-

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hypoglycemic activity.[8-10] Ocimum Sanctum Linn (OS), popularly known as 'Tulsi' has several pharmacological activities including hypolipidaemic-hypoglycemic activity and wound healing activity**.**

MATERIALS AND METHODS

Plant Material:
Fresh Tulsi (Ocimum Sanctum) leaves were purchased from the local market of the Jaipur.

Drugs

Cholesterol - S.d.fine Chemicals Ltd.Mumbai
Streptozotocin - Himidia Ltd.Mumbai
Pravastatin - Ranbaxy India Pvt Ltd.

Animals and their housing:

Albino rats (200-240gm) of Wistar Strain were used. They were housed in a clean polypropylene cage under standard laboratory condition under 12:12 hour light dark cycle, 24±1^{o}C, relative humidity 45-55% and fed normal laboratory chow pellets and water *ad libitum* for 1 week before the experiment. In the entire experimental model, 6 rats were used in each group.

Induction of Hyperlipidemia:

To induce hyperlipidemia, cholesterol diet was given to animals for 28 days. This diet consists of 2% cholesterol, 28% dalda and 70% of pellet chow. [13]

Induction of Type-2 Diabetes:

After the 28 days of dietary manipulation on the confirmation of hyperlipidemia adult Wistar rats were made diabetic with an intraperitoneal injection of Streptozotocin (35 mg/kg) dissolved in the citrate buffer (0.01 M, pH 4.5). Streptozotocin injected animals exhibited massive glycosuria and hyperglycemia within 48-72 Hours. 96 hr after the injection with STZ. Albino rats with plasma glucose level above 200 mg/dL were considered to be diabetic and were used in this experiment. [11,12]
Before the experiments, food was withheld overnight, with free access to water. Rats were anaesthetized with pentobarbitone sodium (25mg/kg I.P.) and blood was collected by tail vein. The blood was then subjected to centrifugation to obtained serum. The collected serum sample was subjected for the estimation of Glucose, Total cholesterol, HDL cholesterol, LDL cholesterol and Triglyceride by using biochemical kits and semi Auto analyzer. [11]

RESULT

Blood Glucose Level- The data observed from this study on 0, 6th, 12th, 18th & 24th day, diabetic hyperlipidemic rats treated with test drug O.S. and Pravastatin showed in Table 1. Diabetic hyperlipidemic control group showed significant ($p<0.001$) increasing in fasting blood glucose level when compare to the normal control group rats. The O.S. significantly ($p<0.01$) decrease in the fasting blood glucose levels on 24th day when compared to the diabetic hyperlipidemic control group rats where as Pravastatin did not decrese glucose level in diabetic hyperlipidemic control group.

Cholesterol level-The animals treated with O.S. and Pravastatin showed extremly significant decrease in the cholesterol level on day 24 when compared with the initial levels (day 0). Table-02

Triglycerides level-O.S. and Pravastatin showed very significant decrease in the

Triglyceride level when compared between Day 0 and Day 24. Table-03

HDL Level- The animals treated with O.S. and Pravastatin showed extremely significant increase in the HDL level when compared with the initial levels. Table-04

LDL Level-O.S. and Pravastatin treated animal groups showed extremely significant decrease in LDL when compared with that of initial blood levels. Table-05

CONCLUSION AND DISCUSSION

When we describe Diabetes, it is not only a single disease but it is combination of diseases. As it is well known that so many times diabetes complication comes in the form of Diabetes Hypelipidemia, this is where patient find the situation exceptionally immeasurable. Plasma lipid levels are elevated in people with diabetes and a direct relationship can be demonstrated between indices of diabetic control and plasma lipid levels.

In the case of fasting blood glucose level, result suggested that Ocimum Sanctum produced the anti-hyperglycemic activity in diabetic hyperlipidemic rats where as Pravastatin, did not shown anti- hyperglycemic activity to reduce the fasting blood glucose level. In the case of lipid profile, results suggest that the Ocimum Sanctum & Pravastatin produced the anti-hyperlipidemic activity in diabetic hyperlipidemic rats.

Ocimum Sanctum has Hypoglycemic and Hypolopidemic activity where as Pravastatin is used to reduce lipid profile. After seeing all the result we could easily say that Ocimum sanctum reduces lipid profile faster than the Pravastatin due to its hypoglycemic action. As glucose level decreded it also helps in to the reduction of the lipids.This study clearly suggest that Ocimum sanctum is good medication in the diabetic hyperlipidemic.

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Table-01: Blood Glucose Level- in diabetic hyperlipidemic rats treated with test drug O.S. and Pravastatin.

Groups	Fasting Blood glucose (mg/dl)				
	Day 0	Day 6	Day 12	Day 18	Day 24
Control	106.30 ± 5.15	106.80 ± 4.39	105.20 ± 3.28	109.00 ± 4.31	110.40 + 4.67
DH control	273.75 ± 8.27	273.03 ± 6.73	275.96 ± 7.99	276.93 ± 6.40	268.48 ± 6.44
O.S.	272.21 ± 6.01	265.00 ± 5.61	251.08 ± 4.90	244.88 ± 4.28	237.50** ± 5.30
Pravastatin (5mg)	281.01 ± 6.17	283.28 ± 5.14	283 ± 4.14	282.96 ± 7.52	284.91 ± 6.74

Values are expressed as Mean ± SD; n=6

*** P<0.001, ** P<0.01, * P<0.05 when compared to DH control group, using one way ANOVA followed by Tukey-Kramer multiple comparison test.

Table-02: Cholesterol level-The animals treated with O.S. and Pravastatin showed extremly significant decrease in the cholesterol level on day 24 when compared with the initial levels (day 0).

GROUPS	CHOLESTEROL (mg/dl)				
	Day 0	Day 6	Day 12	Day 18	Day 24
Control	99.36 ± 4.20	101.13 ± 4.46	99.18 ± 6.15	100.55 ± 4.00	103.18 ± 4.56
DH control	196.3 ± 9.30	196.1 ± 8.63	198.76 ± 8.59	201.25 ± 9.33	201.76 ± 6.79
O.S.	203.23 ± 9.44	187.38 ± 8.65	171.18 ± 7.18	150.05 ± 6.30	146.78*** ± 6.32
Pravastatin (5mg)	206.45 ± 9.25	170.00 ± 8.96	137.86 ± 5.37	114.76 ± 5.51	97.93*** ± 4.60

Values are expressed as Mean ± SD; n=6

*** P<0.001, ** P<0.01, * P<0.05 when compared to DH control group, using one way ANOVA followed by Tukey-Kramer multiple comparison test.

Table-03: Triglycerides level-O.S. and Pravastatin showed very significant decrease in the Triglyceride level when compared between Day 0 and Day 24

GROUPS	TRIGLYCERIDES (mg/dl)				
	Day 0	Day 6	Day 12	Day 18	Day 24
Control	109.71 ± 4.74	113.00 ± 4.82	114.63 ± 4.72	112.61 ± 4.05	114.36 ± 3.44
DH control	209.33 ± 9.83	209.48 ± 8.57	213.58 ± 7.33	211.6 ± 7.70	213.86 ± 8.43
O.S.	209.21 ± 7.81	193.33 ± 6.75	179.80 ± 7.75	165.38 ± 6.49	151.7*** ± 6.11
Pravastatin (5mg)	214.00 ± 8.62	186.55 ± 7.64	166.76 ± 4.01	146.03 ± 4.77	139.05*** ± 5.44

Values are expressed as Mean ± SD; n=6

*** P<0.001, ** P<0.01, * P<0.05 when compared to DH control group, using one way ANOVA followed by Tukey-Kramer multiple comparison test.

Table-04: HDL Level- The animals treated with O.S. and Pravastatin showed extremely significant increase in the HDL level when compared with the initial levels.

GROUPS	HDL (mg/dl)				
	Day 0	Day 6	Day 12	Day 18	Day 24
Control	31.55 ± 1.83	31.81 ± 1.41	32.46 ± 1.34	31.60 ± 1.88	31.85 ± 1.07
DH control	19.83 ± 1.65	20.18 ± 1.63	20.25 ± 1.51	19.75 ± 1.51	20.21 ± 1.25
O.S.	19.90 ± 1.70	20.58 ± 1.93	21.16 ± 1.73	24.20 ± 1.06	27.45*** ± 2.26
Pravastatin (5mg)	19.91 ± 1.61	20.78 ± 1.88	22.33 ± 1.87	25.75 ± 1.91	29.28*** ± 1.29

Values are expressed as Mean ± SD; n=6

*** P<0.001, ** P<0.01, * P<0.05 when compared to DH control group, using one way ANOVA followed by Tukey-Kramer multiple comparison test.

Table-05: LDL Level-O.S. and Pravastatin treated animal groups showed extremely significant decrease in LDL when compared with that of initial blood levels.

GROUPS	LDL (mg/dl)				
	Day 0	Day 6	Day 12	Day 18	Day 24
Control	81.55 ± 3.13	88.71 ± 3.14	81.26 ± 3.23	82.61 ± 3.18	83.28 ± 2.98
DH control	178.2 ± 7.04	180.31 ± 5.64	178.40 ± 5.03	179.61 ± 6.24	182.63 ± 5.16
O.S.	184.75 ± 5.29	173.98 ± 5.33	167.83 ± 6.70	154.66 ± 5.54	147.38*** ± 4.89
Pravastatin (5mg)	182.58 ± 5.58	171.15 ± 5.50	156.00 ± 5.86	144.36 ± 4.92	132.7*** ± 4.83

Values are expressed as Mean ± SD; n=6

*** P<0.001, ** P<0.01, * P<0.05 when compared to DH control group, using one way ANOVA followed by Tukey-Kramer multiple comparison test.