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ENHANCED ADIPONECTIN ACTIVITY BY CURCUMIN IN ALLOXAN INDUCED TYPE2 DIABETIC RATS

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ABSTRACT

Aim: to study the effects of curcumin on blood glucose, lipid profiles and Adiponectin activity in diabetic rats.

Material and Methods: Diabetes mellitus was induced in male wistar rats, which were divided into seven groups and treated with 80mg, 100 mg curcumin/kg body weight and assessed the serum concentrations of blood glucose, insulin, lipid profiles (mg%) as triglycerides, total cholesterol, Low density lipoprotein (LDL)-Cholesterol, High density lipoprotein (HDL)-Cholesterol and Adiponectin.

Results: this study results shows that diabetes mellitus increased the serum levels of glucose, total cholesterols, triglycerides, LDL-Cholesterol and decreased the adiponectin and HDL-Cholestrols, treatment with curcumin alone doses and combination with metformin can significantly decreased the serum levels of glucose, lipid profiles ($p<0.001$) and increased Insulin, Adiponectin treated groups ($p < 0.001$).

Conclusion: In conclusions, the effects of curcumin on blood glucose, serum cholesterol, triglycerides and LDL-Cholesterol levels were decreased and increased the serum levels of Insulin, Adiponectin and HDL-C in curcumin treated groups. It can be suggested that the curcumin is useful for diabetes treatment.

Keywords: Adiponectin, Curcumin, Lipid profiles, Blood glucose

INTRODUCTION

Diabetes mellitus controlling is a great task in the world wise type 2 diabetes mellitus (T2DM), is due to resistance of insulin functions, defaulted elevations of glucose, metabolisms of lipids and deficient of insulin secretions [1]. These consequences are enormous increased the levels of fasting and postprandial glucose [2]. The common cause of T2DM is a insulin resistance and deficient of insulin secretions in many individuals, it responses to observed as hyperinsulinemia and cannot maintain normoglycemia and increased fasting blood glucose progresses [3-4]. The glucose-toxicity, lipo-toxicity and inflammations are causes to decrease the beta-cell functions and their secretions [2]. The metabolism of lipids and glucoses are to disorder of types 2 diabetes mellitus [4]. The adiponectin is a hormone produced from adipose tissues with the properties of insulin sensitizing, anti-apoptotic and anti-inflammatory functions and it is declined in Type2 diabetes mellitus[5]. There is insulin resistance and T2DM were strongly correlated [6-7].

The treatment of type2 diabetes mellitus is the task with antidiabetic drugs [8], So nowadays recommending many phytochemical agents for antidiabetic therapeutics [9-10]. Curcumin is an active componant of turmeric which is belongs to phytochemicals; it has been properties of antioxidant, antiinflammatory, antimicrobial, immunomodulatory, hypoglycaemic and antirheumatic effects [11]. Curcumin controls the hyperglycemia and hyperlipidaemias, so this present study is designed to investigate the effects of curcumin on serum lipid profiles, insulin, adiponectin, and blood glucose in diabetic rats.

MATERIALS AND METHODS

Experimental animals: All the procedures were followed by the animal ethical committee approval of viswabharati education society (no:006). Male wistar rats were procured and selected weight range of 150-200 gm, kept in plastic cages for one week of adaptation under a 12:12 dark/light cycle at 25°C and allow the animals for free access of feed and water.

Chemicals: Pure Curcumin powder was purchased from SS Labs. Alloxan Himedia Mumbai, India. and Metformin gift samples form Natco Pharma, Hyderabad.

Induction of diabetes: The diabetes mellitus was induced in six groups of male wistar rats by a single dose of Alloxan in saline (120 mg/kg body weight) injected intraperitoneally and confirmed the hyperglycemia of fasting blood glucose levels was greater than >200 mg/ dl, after the alloxan 48 hours was considered as diabetics.

Administration of curcumin: Following the diabetes induction, the rats were divided into seven groups, first group kept as normal control, second group as a diabetic control and four groups were treated with curcumin 80 mg/kg, 100 mg/kg alone as third and fourth groups and fifth and sixth and groups were given the combination of Metformin and curcumin, seventh group considered as standard given with Metformin 60mg/kg alone.

Blood biochemical parameter: The blood samples were collected (on 0day,7th day, 14th day and after 21 days curcumin treatment) from the retro orbital of eye, centrifuged at 10000 RPM for 15 minutes, stored at -40°C and estimated the serum glucose [12], insulin [13], lipid profiles [14], and the serum adiponectin [15-16].

Statistical analysis

The data has Mean ± S.D., Statistical comparisons were made by one-way analysis of variance (ANOVA) and data considered significant when the *p* values were lower than 0.05.

RESULTS

The results shows that the 21 days treatment of curcumin alone and combination of metformin on the serum levels of glucose **(Figure 1)**, insulin and adiponectin of the diabetic treated rats were represented in **Figures 2-3**.

The results were shown, there is a diabetes group increased significantly serum glucose levels ($p < 0.001$), reduced Insulin and Adiponectin levels ($p < 0.001$). Our results reveals that curcumin 80 mg/kg and curcumin 100mg/kg body weight, administrations were controlled the blood glucose ($p < 0.05$) and increased the insulin ($p < 0.001$) and adiponectin ($p < 0.001$) in both doses treated animals.

The results of the serum lipid profiles of the treated groups were presented in **Table 1**. The present study results reveal that diabetes group significantly ($p < 0.001$) increased the serum levels of total cholesterol, triglycerides, LDL-Cholesterol and decreased HDL-Cholesterols. Curcumin treatment has been significantly ($p < 0.001$) controlled the serum concentrations of total cholesterol, triglycerides, Low densisty lipoprotein (LDL-Cholesterols) and increased the HDL-Cholesterol.
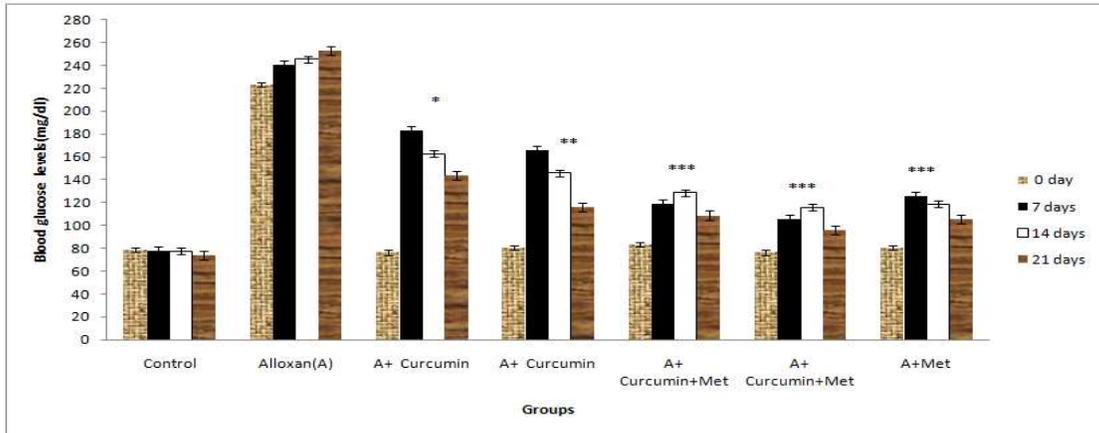
Figure 1: serum glucose levels (mg/dL) of Control, Diabetic, Curcumin 80 and Curcumin 100 (Cur 80 & Cur100)+ combination of Metformin (60mg/kg) treated groups., Mean±SD(n=6) (The p- values *p<0.05, ** p<0.01, *** p<0.001, Compared control vs. diabetic and treated)
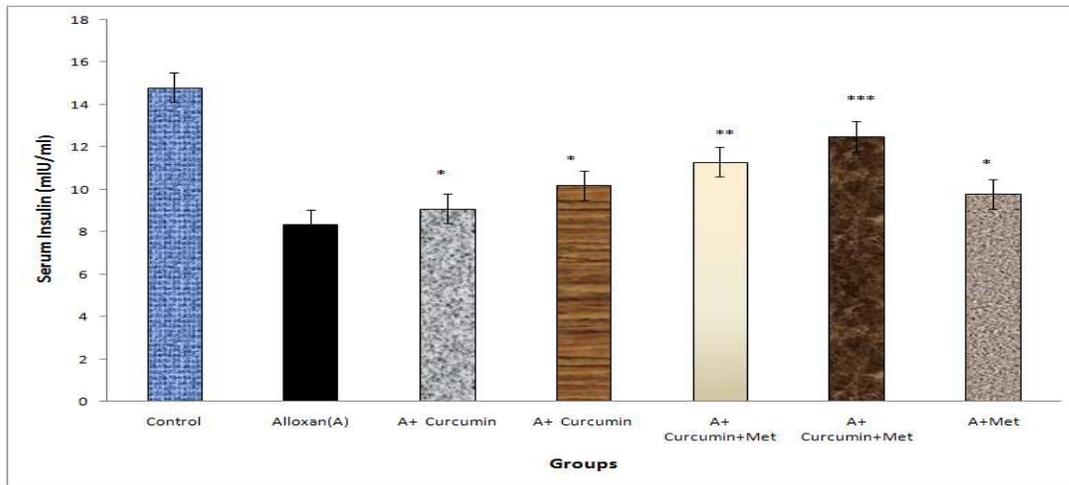

Figure 2: serum Insulin (IU/L) of Control, Diabetic, Curcumi 80, Curcumin 100, (Cur 80 & Cur100)+ combination of Metformin (60mg/kg) treated groups., Mean±SD(n=6);
(The p- values *p<0.05, ** p<0.01, *** p<0.001, Compared control vs. diabetic and treated)
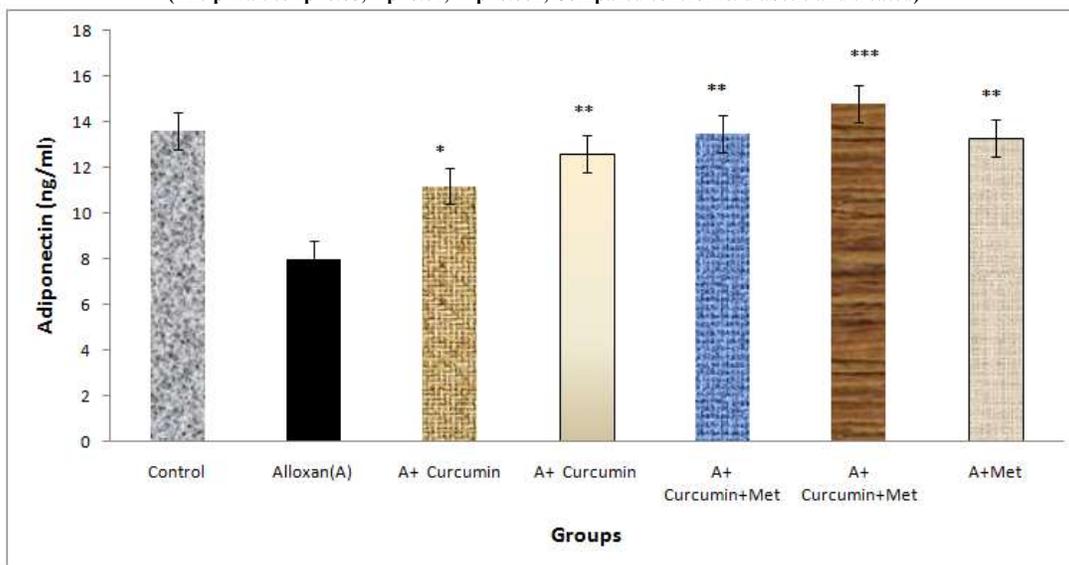

Figure 3: serum Adiponectin activity (ng/ml) of Control, Diabetic, Curcumin 80 and Curcumin 100 (Cur 80 & Cur100)+ combination of Metformin (60mg/kg) treated groups., Mean±SD(n=6) (The p-values *p<0.05, ** p<0.01, *** p<0.001, Compared control vs. diabetic and treated)

Table 1: Effect of Curcumin 80mg , Curcumin 100mg and Metformin (60mg/kg) alone and combinations for 21 days treatment on serum Lipid profiles of control, diabetic and treated groups. (Mean ± SD, n = 6)

Groups/ Parameters	Control	Alloxan(A)	A+ Curcumin	A+ Curcumin	A+ Curcumin+ Met	A+ Curcumin+ Met	A+Met
Total Cholesterol (mg%)	135.1±6.5	227.5±4.7	191.2±8.1[a]	162.6±9.3[b]	121.2±8.1[c]	115.6±9.3[c]	120.6±9.3[c]
Triglycerides (mg%)	118.3±6.6	214.8±13.4	128.6±7.7b	115.7±7.5b	101.6±7.7[b]	96.5±7.5c	76.4±7.5c
VLDL (mg%)	23.6±1.6	42.9±3.1	25.7±2.1[b]	23.1±1.4[b]	20.3±2.1[b]	19.3±1.4[c]	15.5±1.0[c]
LDL (mg%)	76.5±3.1	172.7±9.2	92.0±5.2[b]	73.96±4.1[b]	67.0±5.2[c]	53.96±4.1[c]	69.96±4.1[c]
HDL (mg%)	53.2±2.1	22.4±2.1	34.3±2.3[a]	38.1±1.7[b]	43.8±2.7[b]	48.1±1.7[c]	45.1±1.7c

(The p- values [a]$p<0.05$, [b] $p<0.01$, [c] $p<0.001$, Compared control vs. diabetic and treated)

DISCUSSION

The present study results findings that the type2 diabetic rats were increased the blood glucose and reduced insulin, adiponectin [1-3]. As per that diabetes mellitus causes to destroy the pancreatic beta-cells and thereby increase the blood glucose levels. In this study results reveals that Curcumin oral administration of 80mg, 100mg /kg body weight doses can caused to controlled the blood glucose levels and elevated serum Insulin, adiponectin concentrations.

Curcumin has been properties of antihyperglycaemic effect in diabetics [13], and the different studies of reports revealed that curcumin can improve the insulin sensitivity and reduced the hyperglycemia and dyslipidemias [14-16]. The Curcumin is well improved the adiponectin activity by suppressions of NF-kB functions, which are involved in cancer, inflammation and autoimmune diseases [17]. Our finding reveals that increased the serum levels of insulin and adiponecin after administration of curcumin, there may be a closed relationships between the insulin and adiponectin levels.

Increased the serum levels of total cholesterols, triglycerides and LDL-Cholesterol and decreased the HDL-Cholesterol in diabetic rats [17]. Curcumin reduces the lipid peroxidations and scavenging of oxidative free radicals, there by controlled the serum levels of LDL-C, Triglycerides, Total cholesterols and increased the HDL-Cholesterols [18].

The curcumin treatment, lowering of blood glucose levels of diabetics, protected the pancreatic endocrine/exocrine secretions and also increased the adiponectin, insulin levels.

Further research is required to establish the mechanisms of curcumin in treatment of diabetics.

CONCLUSION

In conclusions, diabetes mellitus can cause to damages the pancreas and increased the serum glucose, lipid profiles LDL-Cholestrol, triglycerides and decreased the insulin and adiponectin, Administration of

the curcumin can improve the Adiponectin, insulin, HDL-C levels and blood glucose, LDL-C and triglycerides levels were decreased. Curcumin therapy is a effective treatment for diabetes mellitus.

Conflict of Interest

Authors have no conflict of interest.

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