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Effect of *Imperata Cylindrica* Roots Extracts on some Cardiovascular Parameters of Diabetic Wistar Rats

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Abstract

Imperata cylindrica is claimed to be of use for the treatment of cardiovascular disorders and diabetes mellitus among other ailments in some cultural settings and this study analyzed the effect of treatment with aqueous extract of *Imperata cylindrica* root on body weight, fasting blood sugar and lipid profile of diabetic Wistar rats; which are closely associated with many cardiovascular disorders.

The hypoglycaemic effect of *Imperata cylindrica* root aqueous extract (AICR) was evaluated with Alloxan induced diabetic rats. 150mg/kg body weight dose of Alloxan Monohydrate was injected IP on 80 Wistar rats and 48 of them were selected with a FBS level above 200mg/dl. These were placed into 6 groups of eight rats each: Non-Diabetic Rats Treated with Distilled Water, Diabetic Control: Alloxan-Induced Diabetic Rats Treated with Distilled Water, Alloxan-Induced Diabetic Rats Treated with AICR (200mg//Kg), Alloxan-Induced Diabetic Rats Treated with AICR (400mg/Kg), Alloxan-Induced Diabetic Rats Treated with AICR (600mg/Kg) and Alloxan-Induced Diabetic Rats Treated with Glibenclamide (0.5 Mg/Kg). Treatment was carried out for 28 days by intragastric administration. The body weight, blood glucose levels and Lipid profile were recorded on the 1st and 28th day of study.

Induction of diabetes mellitus resulted in significantly reduced weight which was reversed by treatment with *Imperata cylindrica* root extract with an increased mean value of 149.9±9.949 to 159.4±3.905, 142.9±9.915 to 153.5±5.292 and 139.5±3.128 to 149.0±5.593 for the groups treated with 200, 400 and 600mg/kg body weight respectively. The extracts also reversed the hyperglycaemia resulting from treatment with Alloxan monohydrate with a decreased mean value of 211.40±2.61 to 132.60±4.76, 212.6±3.93 to 117.50±7.69 and 212.6±3.27 to 151.50±10.05 for the groups treated with 200, 400 and 600mg/kg body weight respectively. Induction of diabetes mellitus resulted in significantly reduced serum lipid levels ($P < 0.01$) but intragastric administration of *Imperata cylindrica* root extract (200, 400, and 600 mg/kg body weight per day) to the groups of diabetic and hypercholesterolaemic rats for 28 days lowered their serum Total Cholesterol (TC), Triglycerides (TG) and Low Density Lipoprotein Cholesterol (LDL) significantly ($P < 0.001$), while the serum high density lipoprotein cholesterol (HDL) level was also raised within this period of treatment.

Hyperlipidaemia and diabetes mellitus are implicated in some cardiovascular ailments and with the side effects of existing anti diabetic and lipid lowering drugs, there is a greater need for safer, more potent drugs that can reduce blood glucose with decrease in both low density lipoprotein cholesterol and Triglycerides which may be found in *Imperata cylindrica* roots.

Keywords: Aqueous Extract of *Imperata Cylindrica Root;* Cardiovascular Diseases; Diabetes Mellitus; High-Density Lipoprotein Cholesterol; Hyperlipidaemia, Low density Lipoprotein cholesterol; Triglycerides; Wistar Rats

Abbreviations: AICR: Aqueous extract of Imperata cylindrica root; CHD: Coronary heart disease; CVD: Cardiovascular diseases; FBS: Fasting blood sugar; GIT: Gastrointestinal tract; H_2O_2: Hydrogen peroxide; HDL: High-density lipoprotein cholesterol;

HMG CoA-reductase: 3-hydroxy-3-methylglutaryl-coenzyme A –reductase; LDL: Low-density lipoprotein cholesterol; SEM: Standard error of mean; TC: Total cholesterol; TG: Triglycerides; VLDL: Very Low-density lipoprotein cholesterol

Introduction

Cardiovascular diseases are a prevalent cause of death worldwide and have become a major challenge for global health [1]. Coronary artery occlusion often begins with atherosclerosis; however, this phenomenon is associated with the deposition of cholesterol and calcium, or the production of cellular waste and other materials in the inner layers of the arteries, together with the formation of connective tissue, termed atherosclerosis plaques [2].

Body weight and composition are important in relation to cardiovascular disorders. The amount and distribution of fat mass and lean mass have been used as predictors of cardiovascular disorders [3]. Lipid is the general name used to describe all the fats within the body. The body needs certain amount of each kind of lipid to function properly. For lipids to be transported in the blood stream and put to use in the body, they combine with proteins. These lipid-protein combinations are called lipoproteins. Lipoproteins are made up of several different kinds of fats. Some cause the development and progression of atherosclerosis, while other lipids are actually helpful in preventing atherosclerosis [4]. One category of blood lipids is cholesterol. Cholesterol is an important substance that many different body tissues and hormones use to function. Cholesterol can be divided into two major types; low density lipoprotein cholesterol [LDL cholesterol-also known as bad cholesterol] and high density lipoprotein cholesterol [HDL cholesterol-also known as the good cholesterol]. LDL cholesterol is the fat that enters the inside lining of the artery and causes atherosclerosis - a stage of arteriosclerosis [hardening of the arteries] involving fatty deposits [atheromas] inside the arterial walls, thus narrowing the arteries [5]. HDL cholesterol actually fights against the buildup of fat in the arteries.

Another group of lipids is known as Triglycerides [TG]. An elevated level of triglycerides has been shown to be correlated with an increased incidence of atherosclerosis [6] and the lowering of blood triglyceride levels has been shown to slow the progression of atherosclerosis [7]. When the blood cholesterol level is high, dietary and life style modifications are first attempted to lower it, but if this is not enough then drugs are introduced to lower it. Thus the lower the blood cholesterol level the less the chance of development of coronary artery disease [8]. The interrelationship between blood lipid levels, elevated blood glucose levels and cardiovascular health is compelling in many ways. The most important clinical manifestation of this interaction is diabetic dyslipedemia. Diabetic dyslipedemia occurs in persons with diabetes and is characterized by a set of three factors that include: low HDL, high LDL and high TG levels [9]. Due to the size of LDL molecules and other factors in diabetic conditions, there exists ability for diabetes to effect the lowering of HDL cholesterol in the blood, while promoting an increase in LDL cholesterol and triglycerides [9]. Dyslipedemia and diabetes mellitus play important roles in clinical medicine since both are well established cardiovascular risk factors and their treatment translates into clinical benefit [10]. Increased lipid levels are managed by lifestyle changes like increased physical activity [11,12], reduced intake of alcoholic beverages, cessation of cigarette smoking [13] and other dietary modifications [14]; but extremely high levels and lipid levels refractory to lifestyle changes are usually treated with drugs. Such drug treatment is usually combined with dietary control and other lifestyle changes [15]. Notable lipid lowering drugs include; Niacin, bile acid sequestrants, Fibrates, HMG-CoA [3-hydroxy-3- methylglutaryl-coenzyme A] reductase inhibitors and Ezetimibe [16-23].

The beneficial effect of lipid lowering drugs are additive and when monotherapy with any of these drugs is not enough to sufficiently lower the blood cholesterol, a combination of hyperlipidaemic drugs is often recommended, but with caution especially due to the side effects [24-27]. The unpleasant side effects of drugs used for the treatment of hyperlipidaemia is the reason for which herbal alternatives are investigated as plants are a resource base for cheap drugs with minimal side effects [28-30].

Methods

Collection of Plant Material

Imperata cylindrica roots were harvested from Awha Imezi in Ezeagu L.G.A. of Enugu State and were identified and authenticated by Mr. Chijioke John Onyeukwu of the Department of Plant Science and Biotechnology, University of Nigeria Nsukka [UNN]. Voucher specimens are deposited in the international center for ethno medicine and drug development herbarium with number UNH166.

Preparation of *Imperata Cylindrica* Root Extract

Imperata cylindrica extracts were prepared as described previously described [31]. In this procedure 500 g of fresh *Imperata cylindrica* roots was washed with water to remove debris and sand and spread under shed to remove excess water. These were subsequently cut into small pieces and then crushed using a household blender. 50 g of the coarsely powdered *Imperata cylindrica* was placed in a container with 100 ml of purified water [aqueous extract] and tightly sealed. The sealed flask was labelled and kept for 3 days with occasional shaking and stirring. After 3 days of maceration, the extracts were filtered through Whatman No. 4 filter paper and the filtrates concentrated by evaporating the solvents alone. The percentage of dried weight of *Imperata cylindrica* extracts yield was calculated and preserved in a clean and dry container until required for the experiments. It was subsequently reconstituted in distilled water to give the doses

required for the study.

Experimental Animals

A total of two hundred adult male Wistar rats weighing between 150 and 200grams were obtained from the animal house of the department of pharmacology and therapeutics for the duration of the study. Each set was allowed to acclimatize for one week with free access to food and water before the study. The rats were provided with whole, ground or dampened grain as required. This research project was reviewed and approved by the University of Nigeria Teaching Hospital-Enugu Health Research Ethics Committee with No. NHREC/05/01/2008B-FWA00002458-1RB00002323.

Induction of Diabetes Mellitus in Wistar Rats with Alloxan

For induction of experimental diabetes, 80 male adult rats weighing 150–250 grams were used.

The rats were fasted prior to injection for about 10 hours. A single dose of Alloxan monohydrate, 150 mg/kg was administered as a 5% w/v in distilled water injected intraperitoneally in the rats. Each rat was placed back into the cage after injection. This procedure was repeated for each animal. The rats were supplied with 10% sucrose water to avoid sudden hypoglycemia post-injection.

Rats were tested for sufficient levels of hyperglycaemia at 4 weeks post injection. Tail blood samples were obtained from fasting rats for blood glucose levels measurement.

Biochemical Analyses

Forty-eight rats were selected for the study: forty with blood glucose levels above 200mg/dl and eight normal rats in which diabetes mellitus were not induced. These were placed into six groups of eight rats in each group:

Group A [Normal Control: Non-Diabetic Rats Treated with Distilled Water],

Group B [Diabetic Control: Alloxan-Induced Diabetic Rats Treated with Distilled Water],

Group C [Test Group1: Alloxan-Induced Diabetic Rats Treated with AICR[200mg//Kg]],

Group D [Test Group2: Alloxan-Induced Diabetic Rats Treated with AICR [400mg/Kg]],

Group E [Test Group3: Alloxan-Induced Diabetic Rats Treated with AICR [600mg/Kg]],

Group F [Positive Control: Alloxan-Induced Diabetic Rats Treated with Glibenclamide [0.5 Mg/Kg]].

The plant extracts and standard drugs were administered by gastric lavage to the rats according to the groupings once in a day for 28 days consecutively.

They were kept in cages separately and their body weight was measured at the beginning and on the 28th day of the study. Twenty-four hours after the last treatment blood was collected by cardiac puncture from each animal into clean dry test tubes. The blood samples were allowed to stand for about 30 minutes to clot. Serum was separated from the clot with Pasteur pipettes into sterile sample tubes for the measurement of the blood glucose, total cholesterol, triglycerides, LDL cholesterol, and HDL cholesterol concentrations.

The Effect of *Imperata Cylindrica* on Body Weight of Wistar Rats After 28 Day Treatment

The rats were weighed with a Mettler balance and the weights recorded at the beginning and on the 28th day of the study.

Effect of *Imperata Cylindrica* Roots Aqueous Extract on Blood Glucose Level of Wistar Rats.

Blood samples were collected with heparinised capillary tubes, and 25-µL aliquots were used to determine the glucose level. A single cut at the tip of each tail was enough to collect all of the blood samples. Blood glucose concentrations were determined using a glucometer [ACCU-CHEK Active. Roche Diagnostics GmbH].

Changes in The Lipid Profile of Alloxan Induced Diabetic Rats Caused by Administration of an Aqueous Extract of *Imperata Cylindrica* Root

Test Principles

A. Total Cholesterol: Cholesterol is measured enzymatically in serum or plasma in a series of coupled reactions that hydrolyze cholesteryl esters and oxidize the 3-OH group of cholesterol. One of the reactions by products, H_2O_2, is measured quantitatively in a peroxidase catalyzed reaction that produces a colour. Absorbance is measured at 500 nm. The colour intensity is proportional to cholesterol concentration.

Elevated levels of cholesterol increase the risk for Coronary Heart Disease [CHD]. Cholesterol is measured to help assess the patient's risk status and to follow the progress of patient's treatment to lower serum cholesterol concentrations. Desirable cholesterol levels are considered to be those below 200 mg/dL in adults and below 170 mg/dL in children [32].

B. Triglycerides: Triglycerides are measured enzymatically in serum or plasma using a series of coupled reactions in which triglycerides are hydrolyzed to produce glycerol. Glycerol is then oxidized using glycerol oxidase, and H_2O_2, one of the reaction products, is measured as described above for cholesterol. Absorbance is measured at 500 nm. Desirable fasting triglyceride levels are considered to be those below 200 mg/dL, and are further categorized as Borderline, 200-400 mg/dL; High, 400-1,000 mg/

dL; and Very High [> 1000 mg/dL] [32].

C. High Density Lipoprotein [HDL] Cholesterol: A low HDL-cholesterol concentration is considered to be a value below 35 mg/dL, and high HDL, >60 mg/dL. HDL values are also used in the calculation of LDL.

HDL is measured directly in serum. The basic principle of the method is as follows. The apoB containing lipoproteins in the specimen are reacted with a blocking reagent that renders them non-reactive with the enzymatic cholesterol reagent under conditions of the assay. The apoB containing lipoproteins are thus effectively excluded from the assay and only HDL is detected under the assay conditions. The method uses sulphated Alkaline Phosphatase ha-cyclodextrin in the presence of Mg+2, which forms complexes with apoB containing lipoproteins, and polyethylene glycol-coupled cholesteryl esterase and cholesterol oxidase for the HDL measurement. Absorbance is measured at 600 nm.

D. LDL levels: LDL was calculated from measured values of total cholesterol, triglycerides and HDL cholesterol according to the relationship: [LDL-chol] = [total chol] - [HDL-chol] - [TG]/5 where [TG]/5 is an estimate of VLDL-cholesterol and all values are expressed in mg/dL [33].

Procedure

Commercial kits [Sigma] were obtained for an assay for each lipid class [TG, TC, & HDL]. The serum concentration of total cholesterol was determined by enzymatic methods using cholesterol ester/oxidase. The serum High-Density Lipoprotein [HDL] content was determined in the supernatant fraction after precipitation of the Low-Density Lipoproteins [LDL] with phosphotungstic acid and Magnesium Chloride. The level of triglycerides in the serum was estimated enzymatically after hydrolysis by lipoprotein lipase in glycerol, then to glycerol phosphate and then to dihydroxyacetone phosphate and H_2O_2, which in the presence of peroxidase was converted to aminophenazone. LDL-cholesterol value was calculated according to Friedewald's formula [LDL= TC - HDL + [TG/5 mg/dl] to obtain the LDL value [33].

Statistical Analysis

Values are expressed as mean ± standard error [mean ± Standard error of mean] of all the observations. Student t-tests were performed to compare the results obtained from each extract with the controls and then analyzed by one-way analysis of variance. Differences among groups were considered as statistically significant at $P<0.05$.

Results

Effect of Treatment with *Imperata Cylindrica* Root Extracts On the Body Weight of Alloxan Induced Diabetic Rat

The body weights of the rats were measured on the 1st and the 28th day of the study and the results are indicated below. Table 1 shows the effect of Glibenclamide and various doses of *Imperata cylindrica* root extract on body weight in Alloxan induced diabetic rats. There was an increase in the body weight of the rats treated with the aqueous extracts of *Imperata cylindrica* root after 28 days when compared with the baseline value using student t test [$p<0.01$]. The weights of the rats in the normal control group increased over the 28-day period [$P<0.05$]. The negative control diabetic rats [group B] that received Alloxan without treatment showed a statistically significant decrease [$P<0.001$] in body weight with an initial mean value of 168.3±10.04g and a final mean of 145.1±13.44g after 28 days.

Treatment groups	Mean initial body weight [g]	Mean final body weight [g]
Group A	159.0±11.99	166.8±13.34
Group B	168.3±10.04	145.1±13.44
Group C	149.9±9.949	159.4±3.905
Group D	142.9±9.915	153.5±5.292
Group E	139.5±3.128	149.0±5.593
Group F	150.9±6.607	151.0±6.964

Table 1: Analysis of the effect of *Imperata cylindrica* on body weight of Wistar rats before and after 28-day treatment.

Effect of *Imperata Cylindrica* Roots Aqueous Extracts on Blood Glucose Levels of Alloxan Induced Diabetic Wistar Rats

The anti-hyperglycemic effect of the three doses of aqueous extract of *Imperata cylindrica* root on the fasting blood sugar levels of diabetic rats is shown in Table 2. Administration of Alloxan [150 mg/kg, i.p.] lead to an elevation of fasting blood glucose levels which was reversed by Four weeks of daily treatment with *Imperata Cylindrica* roots aqueous extract by 25%–50% for the three analyzed doses. This effect was maintained for the 28 days of treatment.

Treatment groups	Mean initial FBS	Mean final FBS
Group A	87.25±4.01	90.38±5.62↓*
Group B	211.60±2.34	202.00±1.21↓**
Group C	211.40±2.61	132.60±4.76↓***
Group D	212.6±3.93	117.50±7.69↓***
Group E	212.6±3.27	151.50±10.05↓***
Group F	222.10±7.89	86.25±6.41↓****
Values are expressed as arithmetic mean±sem, N=8. ** P<0.05. ***P<0.001. ****P<0.0001.		

Table 2: The effect of an aqueous extract of *Imperata cylindrica* roots on the fasting blood glucose in normal, diabetic and diabetic treated rats.

The Effect of an Aqueous Extract of *Imperata Cylindrica* Roots on the Lipid Profile of Normal, Diabetic and Diabetic Treated Rats [Mg/Dl]

The induction of diabetes resulted in significantly reduced HDL level and increased TC, LDL and TG levels [p<0.01]. Treatment with three different doses of an aqueous extract of *Imperata cylindrica* root resulted in the decrease of TC, LDL & TG levels in treated groups [P < 0.001] and significant increase of HDL level [p<0.01] (Table 3a-3d).

Group	Baseline mean±sem	After 28 days mean±sem	P-value
A	54.34±0.86	54.01±1.31	0.2365
B	192.8±3.33	180.1±4.45	0.1121
C	197.0±1.74	95.48± 1.12	<0.0001
D	194.4±2.01	108.30±0.10.30	<0.0001
E	196.1±1.70	155.9±1.03	0.0011
F	201.4±1.04	76.88±3.99	<0.0001

Table 3a: The effect of an Aqueous extract of *Imperata cylindrica* roots on the triglycerides of normal, diabetic and diabetic treated rats [mg/dl].

Group	Baseline mean±sem	After 28days mean±sem	P-value
A	20.68±0.56	20.25±0.51	0.6318
B	85.45±0.83	82.75±2.40	0.0611
C	89.36±1.58	38.13±1.66	<0.0001
D	88.2±2.15	37.25±2.25	<0.0001
E	86.45±3.97	30.75±1.79	<0.0001
F	88.84±2.10	31.44±2.69	<0.0001

Table 3b: The effect of an Aqueous extract of *Imperata cylindrica* roots on the low density lipoprotein of normal, diabetic and diabetic treated rats [mg/dl].

Group	Baseline mean±sem	After 28days mean±sem	P-value
A	44.11±0.45	43.69±0.71	0.0622
B	32.72±1.45	33.55±2.08	0.3853
C	33.38.±1.80	41.04±2.27	0.0027
D	34.5±0.99	43.80±0.88	<0.0001
E	34.12±0.62	43.91±1.76	0.0025
F	34.01±0.66	43.41±2.14	0.0032

Table 3c: The effect of an Aqueous extract of *Imperata cylindrica* roots on the high density lipoprotein of normal, diabetic and diabetic treated rats [mg/dl].

Group	Baseline mean±sem	After 28days mean±sem	P-value
A	72.07±0.83	7.47±2.15	0.1139
B	144.1±1.35	142.0±5.85	0.0556

C	164.6±1.72	98.17±2.78	<0.0001
D	160.1±2.56	103.4±3.03	<0.0001
E	158.2±4.12	105.8±2.60	<0.0001
F	163.4±4.20	91.84±3.05	<0.0001
Values are expressed as mean±sem, n=8.			

Table 3d: The effect of an aqueous extract of *Imperata cylindrica* roots on the total cholesterol of normal, diabetic and diabetic treated rats [mg/dl].

Discussion

Alloxan was used to induce diabetes in this study as it is a well- known diabetogenic agent widely used to induce diabetes in animal models [31,32]. Rats were induced diabetes by the administration of single intraperitoneal dose of Alloxan monohydrate [150 mg/kg]. After 28 days of Alloxan injection; a decreased body weight, an increase in blood sugar level plus changes in the lipid profile were observed. These are some indices of the negative biochemical effects associated with Alloxan induction of Diabetes Mellitus [33]. This reduction of body weight can be due to breakdown of tissue proteins in diabetic rats [34].

This decrease in the body weight of the experimental animals due to the induction of diabetes mellitus was reversed by treatment with the extract. There was a significant increase in the body weight of the rats treated with the aqueous extract of *Imperata cylindrica* root after 28 days when compared with the baseline value. In diabetic rats, observed reduction in body weight was possible due to catabolism of fats and protein. The administration of the aqueous extract of *Imperata cylindrica* improves body weight compared to diabetic control rats which indicates preventive effect of the *Imperata cylindrica* root extract on degradation of structural proteins [28]. In the same vein, the administration of an aqueous extract of *Imperata cylindrica* roots to Alloxan induced hyperglycaemic rats demonstrated a reduction in blood sugar level and normalization of serum lipid profiles as compared to Alloxan induced negative control rats.

Alloxan monohydrate [150 mg/kg, i.p.] lead to an elevation of fasting blood glucose levels, which was maintained over a period of 28 days. Four weeks of daily treatment of various doses of *Imperata cylindrica* roots aqueous extract lead to a fall in blood sugar levels for the three analyzed doses. The increase in blood glucose level after Alloxan administration may be due to insulin deficiency or resistance state in diabetic rats. Administration of the Aqueous extract of *Imperata cylindrica* root significantly reduced blood glucose level in diabetic rats which represents reversal of insulin resistance or increasing insulin secretion possibly by regeneration of damaged pancreatic β-cells in Alloxan-induced diabetic rats [35].

The effects of the aqueous extract of *Imperata cylindrica* roots and Alloxan treatment on serum lipid profile show that there were statistically significant increases in the values of Triglycerides [TG] High Density Lipoprotein Cholesterol [HDL] and Low Density Lipoprotein Cholesterol [LDL] in the Diabetic untreated group B when compared to the normal control group A. There was also significant decrease in the values of Total Cholesterol, triglyceride, High Density Lipoprotein [HDL] and low density lipoprotein in the Alloxan treated group compared after treatment with three different doses of aqueous extract of *Imperata cylindrica* root [200, 400 and 600mg/kg body weight] at P<0.0001 in each case. Rats treated with the three doses of aqueous extract of *Imperata cylindrica* root after induction of Diabetes Mellitus with Alloxan did not show any statistically significant difference in their serum lipid levels when compared to the positive control Glibenclamide treated group. However, there was a more remarkable reduction in the total cholesterol levels of rats treated with 200mg/kg of aqueous extract of *Imperata cylindrica* root compared to the ones treated with 400 and 600mg/kg of aqueous extract of *Imperata cylindrica* root. This decrease in the levels of serum lipids in rats treated with only 200mg/kg of extract show that the hypolipidemic effect of aqueous extract of *Imperata cylindrica* root is more at that dose compared to the others.

The most common lipid abnormalities in diabetes are hypertriglyceridemia and hypercholesterolemia. The abnormal high concentrations of serum lipids in diabetic animals are mainly due to an increased mobilization of free fatty acids from peripheral fat depots. Studies show that high density lipoprotein cholesterol helps reduce the risk of heart disease while low density lipoprotein cholesterol increases it [36-38]. Some studies have identified lipids associated with type 2 diabetes [39] and coronary artery disease [40]. The publication of the National Institutes of Health-sponsored LRC-CPPT -Lipid Research Clinics Coronary Primary Prevention Trial [41] became the basis for the first National Cholesterol Education Program Adult Treatment Panel [NCEP] guidelines [42,43] which show the reduction in LDL-C levels to decrease CVD, often referred to as the lipid hypothesis. Considering that administration of the aqueous extract of *Imperata cylindrica* roots decreased levels of Total Cholesterol, Low Density Lipoprotein

and Triglyceride levels as well as increased the level of High Density Lipoprotein in diabetic rats; this could be beneficial in preventing diabetic complications such as coronary heart diseases and atherosclerosis in diabetic condition [44].

Conclusion

In diabetic condition, elevated blood glucose, reduction in body weight, and dyslipedemia are commonly observed. In the present study, induction of diabetes by Alloxan produced increase in blood glucose level, decrease in body weight and dyslipedemia but the administration of the extracts of *Imperata cylindrica* roots to Alloxan induced hyperglycaemic Wistar rats demonstrated prominently increased weight, reduction in blood sugar level and normalization of serum biochemical profiles including lipid content. This work may be proof not only of the antidiabetic properties of *Imperata cylindrica* roots but also of its value in the traditional use for the treatment of cardiovascular disorders.

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Authors' Contributions

Ghasi SI and Nwokike MO: Designed the study and performed the experiments

Ghasi SI: Conducted the data analysis

Nwokike MO, Ogbonna and Anusiem CA: Participated in drafting the paper

Nwokike Matthew: Wrote the manuscript. All authors read and approved the manuscript.

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