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Original Article

Amelioration of Diabetic Nephropathy in Streptozotocin-induced Diabetic Rats by *Jasminum auriculatum* Vahl. Leaves Extract

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ABSTRACT

Background: Considering the growing preference for herbal medications over their synthetic counterparts it is the need to combat the global end stage renal disease in Diabetic Nephropathy problem. In AYUSH medicine, the *Jasminum auriculatum* vahl. tree is the one that is used. The Oleaceae family includes some of the most notable medicinal plants, including *Jasminum auriculatum* vahl. sometimes known as Juhi. **Objectives:** This study was designed to investigate the effect of *Jasminum auriculatum* vahl. Leaves Extract (JALE) in retarding the progression of diabetic nephropathy in Streptozotocin (STZ)-induced diabetic rat's model. **Materials and Methods:** In this study, diabetes was induced by a single injection of streptozotocin 60 mg/kg. STZ diabetic rats were treated with oral doses of JALE (300 and 500 mg/kg) for 8 weeks. At the end of the experimental period, body and kidney weight and blood glucose levels, Serum, lipids, histopathological parameters were investigated. **Results:** At the end of the experimental period check the BGL, BW and BUN, CRE level of the rats in the diabetic control is increase and reduced total protein as versus negative control group ($^{###}p<0.001$). In the activities anti-diabetic nephropathy to treat diabetic JALE at a various dosage and of metformin 100 mg/kg as a standard drug were used for 8 weeks exhibited reduced BUN, CRE, TG and increase total protein level was heavily in the JALE 500 mg/kg versus with diabetic group $^{**}p<0.001$; $^{*}p<0.05$ and same effect is observed in standard drug and slightly effect on low dose of JALE $^{***}p<0.001$. The results of the histopathology investigation showed that, compared to a diabetic rat kidney, the treated STZ diabetic rats with JALE reduced GBS, glomerular congestion and vacuolar degeneration of tubules. **Conclusion:** *J. auriculatum* vahl. is considered as an effective management of DN conditions as it lowers the blood glucose and heals the structure of nephrons. According to the study, JALE therapy might significantly enhance renal function in T2DM rats through affecting the parameters of renal function.

Keyword: Diabetic nephropathy, End Stage Renal Disease, *Jasminum auriculatum* vahl., herbal medications, Streptozotocin (STZ).

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INTRODUCTION

Diabetic Nephropathy (DN), another common complication of T1DM and T2DM is usually connected with both types of diabetes.[1] Despite the fact that DN is normally thought of as primarily a metabolic disease, mounting evidence suggests that immunological response is crucial in the development of this condition.[2] According to the IDF, there are 425 million cases of diabetes globally, making it the biggest pandemic of the twenty-first century.[3] The most common and the most scary long-term microvascular adverse effects of diabetes is DN, which mostly causes ESRD. The early stages of the traditional DN presentation are characterized by hyperfiltration and albuminuria, which are thereafter followed by a steady loss in renal function.[4] High blood pressure and chronic hyperglycemia are the primary risk factors for developing DN.[5] It affects up to 50% of people having diabetes, is a key contributor to ESRD, which calls for dialysis or a kidney transplant and is linked to much higher mortality and cardiovascular disease rates. Although persistent albuminuria and a progressive deterioration in renal function are the hallmarks of the clinical syndrome known as DN, it is becoming more apparent that the medical course and expression of CKD, in people with diabetes can vary.[2,6]

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Micro and macroalbuminuria, structural alterations such thinning of the glomerular filtration, fibrosis of the interstitial spaces, the development of nodular glomerulosclerosis, as well as reduced cell endothelium fenestration are all characteristics of DN.[7] Diabetic nephropathy affects around 1/3 of diabetic patients. DN frequently progresses to ESRD, in patients with micro and macro-albuminuria.[8] Microalbuminuria is the first indicator of DN. Nearly 20% of patients experience ESRD and 20% of patients experience nephropathy from microalbuminuria during a decade. High albumin excretion in the urine, hyperfiltration, renal hypertrophy, glomerular and mesangial enlargement with ECM protein aggregation, including fibronectin, laminin and collagen are early signs of DN.[9]

Pregnancies among women who have pregestational diabetes have been rising rapidly all over the world. Miscarriages, congenital abnormalities, macrosomia, foetal development restriction and stillbirth are just a few of the issues these pregnancies are more likely to experience. It's critical to consider both the impact of kidney disease on pregnancy outcomes and the impact of pregnancy on kidney function in pregnant women with diabetic nephropathy.[10] As of now, RASIs, such as ACEIs or ARBs, are first line therapies for the treatment and management of diabetes mellitus.[11,12]

Jasminum auriculatum vahl. is a kind of *Jasminum* that is a part of the *Oleaceae* family. It is grown commercially in India and Thailand and is widely distributed around Bhutan, Sri Lanka, as well as India Andaman Islands and Nepal. *Jasminum auriculatum* leaves provide a variety of medicinal benefits, including diuretic, antilithiatic and wound-healing effects. They are used to treat wounds, ulcers, leprosy and skin diseases.[13,14] In the current work, gold nanoparticles are created using to treat antibacterial and anticancer properties of biogenic gold nanoparticles.[15] It has large variety of phytoconstituents like saponins, flavonoids, alkaloids, carbohydrate, tannins, steroids, terpenoids, phenols, protein, glycoside, mucilage's.[16,17] *Jasminum auriculatum* is having capacity to heal wounds with their available active phyocontituents.[18]

MATERIALS AND METHODS

Chemicals and Drugs

The chemicals used included STZ (GLR innovations Pvt. Ltd., New Delhi, INDIA), Metformin (USB Pvt. Ltd., Mumbai), Methanol, ethanol, Petroleum ether, chloroform, ethyl acetate, tri sodium citrate (Central Drugs House Pvt. Ltd.,) Citric acid (GlaxoSmithKline pharmaceuticals Ltd., Mumbai), Glucometer (Dr. Morepen Laboratories Ltd., Baddi, Himachal Pradesh).

Procurement and Authentication of Plant Material

***Recent leaves of Jasminum auriculatum* vahl.**

were collected from local Roots Nursery alpha-1, Greater Noida during Sep. 2022. The plant was authenticated and identified by Dr. R.K Pamarthi, senior scientist, National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi-110012 and specimen voucher no. (Ref No. NHCP/AC-78/2022 dated 14.10.2022).

Plant Extraction Preparation

Jasminum auriculatum vahl. leaves were collected, rinsed under running water and allowed to air dry for two weeks in the shade. To prevent contamination, the dried leaves were first ground into a coarse powder and then placed inside a plastic container with a sealable lid. 250 g of dried and powdered *Jasminum auriculatum* vahl. were extracted using the Soxhlet method at a temperature of 40°C for 4 hr using ethanol (500 mL) as the solvent. The extracts were purified and concentrated using a rotating vacuum evaporator while they were under vacuum and they were then kept at 40°C for 4 hr in desiccators until use. Then the extract was filtered using a No. 42 Whatman filter before using a rotary evaporator set to 50°C to thicken it to the desired viscosity.[13]

Preliminary phytochemicals screening

The usual approach was used in the chemical analysis of JALE. The availability of steroids, glycosides, tannins, saponins, flavonoids, alkaloids and other compounds was checked in plant extract. Alkaloids (Dragendroff's Test, Murexide Test), Tannins (Ferric Chloride Test), Carbohydrate (Fehling Test), Steroids (Salkowski Test) and Protein (Biurets Test, Millions Test), Protein (Biurets and millions test), Flavonoids (Shinoda test, lead acetate test) are all tests used to detect the presence of flavonoids, alkaloids and protein etc.[19]

Acute Oral toxicity Studies

Based on the OECD 420 recommendation, research of the acute oral toxicity of *Jasminum auriculatum* vahl. was conducted. Five healthy female rats (nulliparous and not pregnant) weighing 200-250 g were utilised after a week of acclimatisation. The female albino wistar rat that had been fasting for 3 hr were administered orally 5, 50, 300 and 2000 mg/kg of the leaf extract on the first day of the test, with a 300 mg/kg first dosage.[20] The rat was then maintained under strict observation for 24 hr to look for any physical or behavioural changes, with the initial 30 min receiving extra attention, followed by the first 4 hr of observation. The other four female rats were given a single dosage of the leaf extract (2000 mg/kg) and then watched in the same way because mortality was not seen in the first animal. No evidence of toxicity or mortality was seen during the additional 14 days of surveillance.

Experiment

Experimental Animals

Wistar albino rat 2-3-month-old weighing 200-250 g of both the sex are used for anti-Diabetes nephropathy activity.[21] They were obtained from Central Animal House of Noida institute of Engineering and Technology (Pharmacy Institute), Greater Noida. The study was approved by IAEC approval no. IAEC/

NIET/2022/02/06. The animal will acclimatize in conventional settings, including a room temperature of 25±2°C and a humidity level of 45-55%, a 12 hr dark/light cycle and a diet and water *ad libitum* mouse and rat feed. All studies must abide by all applicable ethical standards, which will be monitored by the CCSEA.

Experimental design and induction of STZ induced diabetes rat

STZ, 60 mg/kg, freshly made in 0.1 Molar CB (pH 4.5), which was used to cause T2DM, was given to rats after acclimatisation for 7 days. The negative control group obtained an identical dosage of the vehicle (0.1 Molar CB; pH 4.5) and 7 days after induction, the BGL was check from the rat's tail vein using a sugar metre (Dr Morepen Laboratories Ltd., Baddi, Himachal Pradesh). Diabetes was defined as having a BGL more than <220 mg/dL and rats with this condition were treated and used for further research.[21]

JALE were administered 300 or 500 mg/kg by oral route per day to rats for eight weeks same as standard drug like Metformin (mtf.) 100 mg/kg.[22] The doses are selected after performing acute oral toxicity study (OECD Guideline no. 420). The treatment plans were based on earlier research and test runs conducted in our lab.

The Albino wistar rats were put into five groups at random: a negative group (n=6); a group with diabetes caused by STZ (n=6); a group with diabetes caused by STZ treated with mtf. 100 mg/kg; a group with diabetes caused by STZ treated with JALE 300 mg/kg; and a group with diabetes caused by STZ treated with JALE 500 mg/kg.

The AOTS was utilised to choose the appropriate two doses of extract after testing in the plant. Prior to therapy 8-week marks of the experiment, BGL and BW were recorded. The rats underwent an overnight fast at the experiment's conclusion before blood was taken from the puncture wound on their hearts. To perform the various biochemical estimates, serum samples were used.

Experimental Protocol

Five sets of six rats each, made up of 6 normal rats and 24 diabetic rats were created:

Group I (Normal Control): Throughout the trial, normal saline was given to the control rats,

Group II (Diabetic Control): Positive control rats were given a single i.p injection of recently made STZ 60 mg/kg,

Group III (STZ/Metformin 100mg/kg): Diabetes induced rat were treating with met. 100 mg/kg, orally/day for 8 weeks,

Group IV (STZ/Low Dose JALE): Diabetes induced rat were treating with leaf extract of *Jasminum auriculatum* vahl 300 mg/kg orally/day for 8 weeks,

Group V (STZ/High Dose JALE): Diabetes induced rat were treating with leaf extract of *Jasminum auriculatum* Vahl 500 mg/kg orally/day for 8 weeks.

Effect of JALE in Blood Glucose Level (BGL) on STZ diabetic rats

Upon the onset of diabetes, BGL was check at the beginning and end of the trial for each rat. The blood was withdrawal from rats by tail vein and after checking the BGL showed substantial BGL higher than <220 mg/dL on diabetic rats as compared to negative control and after administration with JALE diabetic

Table 1: Effect of JALE in Blood Glucose Level (Mmol/L) of STZ-diabetic rats.

Sl. No.	Groups	Before induction diabetes BGL in rats (Mmol/L)	After induction diabetes BGL in rats (Mmol/L)	1 week	2 weeks	4 weeks	6 weeks	8 weeks
1	Negative Control Group	4.55±0.15	4.45±0.33	4.33±0.23	4.42±0.31	4.58±0.32	4.55±0.27	4.43±031
2	Positive Control Group (STZ)	4.45±0.29	24.02±0.54###	25.38±0.23###	26.87±0.28###	23.55±0.29###	26.43±0.26###	26.37±0.28###
3	100 mg/kg Metformin (Standard)	4.63±0.27*	25.50±0.25***	20.35±25***	19.47±0.22***	17.43±0.29***	16.23±0.15***	15.82±0.82***
4	300 mg/kg JALE	4.78±0.08*	25.38±0.29*	23.28±0.28*	21.60±0.27*	19.40±0.19*	18.33±0.18*	17.72±0.31*
5	500 mg/kg JALE	4.68±0.25*	24.37±0.27**	21.42±0.23**	20.52±0.26**	19.53±0.24**	17.53±0.29**	16.42±0.25**

rats as compared to diabetic control group rats during 8-weeks investigation.

Effect of JALE in Body weight on STZ diabetes rat's

Each animal's BW was recorded at the starting and ends of the trial. After induction of diabetes, diabetic rats as compared with normal rats lost weight significantly at the end of the course of the 8-week investigation. The body weight was significantly different following JALE treatment versus to STZ diabetic rats.

Effect of JALE in Serum Biochemical on STZ diabetic rats

After the experimentation was finished, rats' hearts were punctured the blood was then collected in a sample tube (vacutainer blood collection tube). Until the assay, blood samples were kept at 20°C after being centrifuged at 1300 g to separate the serum. The estimation of the levels of Scr, BUN, TG, TP and TC were carried out. Utilising biochemical kits and VDRL, every serum parameter measurement was done on STZ diabetic treated and untreated rats.[23]

Kidney histopathological examination in STZ diabetic rats

Following the conclusion of the clinical effect, rats were phenobarbital-ammunized, sacrificed and the kidney were removed for histological analysis. After being quickly stored in 20% neutral buffer formalin, which is the renal tissues were dried using a graduated alcohol sequence, integrated with paraffin and cut into five mm slices and coloured using the haematoxylin-eosin procedure, light microscopy was used to inspect the slides at a 400x magnification level for microscopic changes that might have clinical relevance. These histological examination parameters like atrophy of the glomerulus were observed with dilated Glomerular space, Glomeruli Bowman's capsule (GBS), glomerular congestion, vacuolar degeneration of tubules.[24,25]

Statistical analysis

The statistical data express in Mean±SEM. the GraphPad programme in state software 9.5.1 for the statistical analysis, Windows (GraphPad Software) was utilised and data was examined using a one-way statistical Analysis of Variance (ANOVA), with a substantially level of $p<0.05$ being used for the Tukey's *posthoc* analysis test.

RESULTS

Preliminary phytochemicals screening

When JALE was subjected to a preliminary phytochemical screening, it was discovered that substances such tannins, alkaloids, glycosides, steroids, flavonoids and saponins, carbohydrates were among the phytoconstituents present.

Acute Oral toxicity Studies

At all doses of the extracts up to 2000 mg/kg, the animals showed no symptoms of either toxicity or mortality. The extracts' oral LD_{50} is around 2000 mg/kg. Therefore, JALE used an oral dose of 2000 mg/kg to be safe used in other pharmacological experiments.

Effect of JALE in BGL on STZ diabetic rats

After STZ was administered eight weeks after induction, the BGL levels of the diabetic rats substantially rise as versus to the NCG ($^{###}p<0.001$). A reduction in BGL levels were also shown in STZ-diabetic rats receiving 300 and 500 mg/kg JALE at the end of 8 weeks as compared to the group of positive control rats ($^{**}p<0.01$; $^{*}p<0.05$). The same result was found in STZ-diabetic rats receiving metformin 100 mg/kg treatment, which was substantially lower the BGL versus with diabetic group ($^{***}p<0.00$). From the starting of the study to its conclusion, the BGL is displayed in a Table 1 which shows the effect of JALE on Blood Glucose Level (Mmol/L) in diabetic rats and Figure 1 showed the effect of JALE in BGL in diabetic rats.

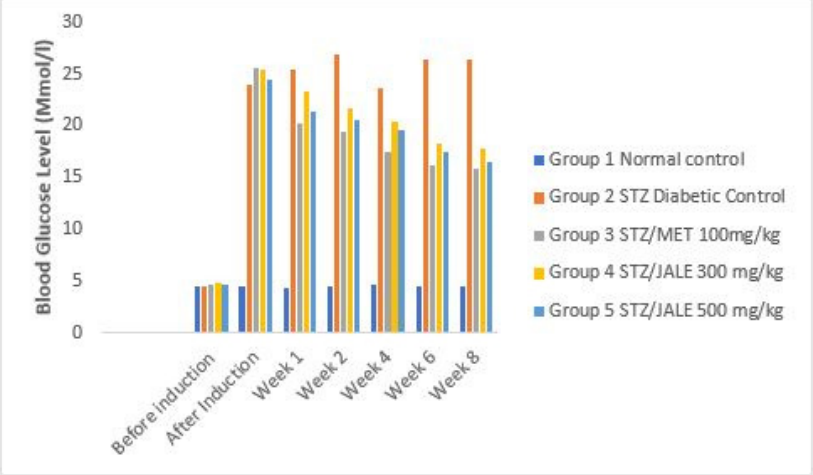

Figure 1: Effect of JALE in BGL on STZ-diabetic rats.

Statistical data is represented as MEAN±SEM, ***p<0.001 and **p<0.01, *p<0.05, when versus with Positive control group, when versus with normal control group, $^{###}p$<0.001; $^{##}p$<0.01; $^{#}p$<0.05, one-way ANOVA with Tukey's *post-hoc* analysis, (n=6); n=6: JALE represented as *Jasminum auriculatum* vahl leaves extract, met., std represented as metformin standard drug.

The statistical data represent in MEAN±SEM and is highly substantial; as compared to the diabetic rats with normal control group, ($^{###}p$<0.001, $^{##}p$<0.01, $^{#}p$<0.05), when compared to the diabetic rats ($^{***}p$<0.001, $^{**}p$<0.01, $^{*}p$<0.05). by using one-way ANOVA with Tukey's *post-hoc* analysis.

Statistical data represent in MEAN±SEM, after treatment 8 weeks; versus control group $^{###}p$<0.001 and $^{##}p$<0.01, $^{#}p$<0.05 and ***p<0.001; **p<0.01; *p<0.05, versus diabetic control group by one-way ANOVA with Tukey's *post-hoc* analysis, (n=6).

Effect of JALE in Body weight on STZ induced diabetes rats

Animals with STZ diabetes substantially decreased body weight during an eight-week period when versus to normal groups ($^{###}p$<0.001). At the conclusion of an 8-week treatment period, rats ameliorate with JALE at quantities of 300 or 500 mg/kg had substantial higher BW than the positive rats (**p<0.01, *p<0.05); the same as for diabetic treated rats with met at a level of 100 mg/kg substantially higher BW than the positive control rats (***p<0.001). From the starting of the experiment to its conclusion, the BW is displayed in a Table 2 which showed the effect of JALE on Body weight in diabetic rats and Figure 2 revealed the effect of JALE on Body weight in diabetic rats.

Table 2: Effect of JALE in Body weight of STZ-diabetic rats.

Weeks after treat and untreated	Negative Control Group	Positive Control Group (STZ)	100 mg/kg (Met., Std)	300 mg/kg JALE	500 mg/kg JALE
Before induction diabetes body weight in rats (g).	187.83±0.70	185±1.16	215.83±1.47	205.33±1.03	216.67±1.63
After induction diabetes body weight in rats (g).	185.16±1.16	131.50±0.67$^{###}$	139.33±1.92***	121.83±1.19*	135.17±0.47**
1 week	187.66±0.61	126.66±0.66$^{###}$	153.33±0.66***	135.83±1.24*	144.00±1.06**
2 weeks	192.83±0.60	124.66±0.33$^{###}$	175.00±0.25***	142.00±0.73*	164.83±0.70**
4 weeks	193.66±0.95	131.16±0.47$^{###}$	184.33±1.50***	146.00±1.03*	176.67±0.66**
6 weeks	205.66±1.38	125.83±0.47$^{###}$	202.00±1.52***	152.00±0.57*	192.66±0.55**
8 weeks	202.66±0.66	131.33±0.47$^{###}$	226.16±6.70***	173.00±0.96*	210.83±2.07**

Table 3: Effect of JALE in Serum parameters on STZ diabetic rats.

Serum Parameters	Negative Control Group	Positive Control Group (STZ)	STD Group Metformin 100 mg/kg	Test 1 JALE 300 mg/kg	Test-2 JALE 500 mg/kg
BUN (mg/dL)	18.69±1.37	24.51±2.97$^{###}$	17.21±4.75***	23.02±2.82*	25.07±2.50**
Total Cholesterol (mg/dL)	75.25±2.22	105.75±1.28$^{###}$	81.25±2.17***	92.15±1.43*	89.15±1.75**
Tri glyceride (mg/dL)	54.15±2.27	140.75±1.28$^{###}$	67.25±2.17***	97.25±1.43*	77.15±1.75**
Scr Level (mg/dL)	0.23±0.03	1.58±0.07$^{###}$	0.41±0.03***	0.88±0.05*	0.55±0.02**
TP (g/dL)	8.03±0.01	5.26±0.39$^{###}$	7.82±0.39***	6.01±0.03*	6.71±0.52**

Effect of JALE inSerum parameters on STZdiabetes rats

The effect on serum parameters after induction of diabetes in diabetic rats with respect to the parameters like BUN, Scr, TC, TG were increased and TP reduced when compared with the control group with diabetic rats ($^{###}p<0.001$).

After treatment with JALE experimental groups for 8 weeks for diabetic rats, STZ positive control diabetic rats, showed reduced serum BUN, Scr levels, TC, TG and increase TP was significantly in the high dose of JALE at 500 mg/kg as compared with diabetic group and same effect is observed in Met. (std. drug) $^{***}p<0.001$; $^{**}p<0.01$ and slightly different on low dose of JALE 300 mg/kg group $^{*}p<0.05$.

The information showed that JALE influences renal function parameters and that JALE administration could significantly enhance renal function in T2DM mice. The STZ diabetic rats' parameters are shown in Table 3 revealing the effect of JALE on Serum parameters in diabetic rats and Figure 3 showed the effect of JALE on BUN, TC, TG in diabetic rats.

Kidney histopathological examination of STZ diabetic rats

With respect to a typical rat kidney; every anatomical feature appears to be in place (X400) Figure 4 (A): In rats with diabetes who received STZ (60 mg/kg) diabetic control rat kidney, there is an increase in GBS, glomerular space, moderate glomerular congestion, atrophy of the glomerulus was observed with dilated glomerular space and increased vacuolar degenerated tubules as compared to control rat kidney as shown in Figure 4 (B); and however, the treatment of JALE extract (300 and 500 mg/kg) or met. (100) for up to 8 weeks corrected the anomaly in the kidney's morphological architecture. JALE treatment considerably reduced the changes, suggesting its protective effect in preventing renal injury. The STZ diabetic rats treated with JALE and met. And find demonstrating reduced GBS, glomerular space and mild glomerular congestion, atrophy of the glomerulus observed with constricted GS and reduced vacuolar degeneration of tubules as compared to STZ diabetic rat kidney (Figure 4C, D and E). Figure 4 kidney microscope images (400x magnifications using a light microscope with hematoxylin and eosin staining) on STZ induced diabetes in rats.

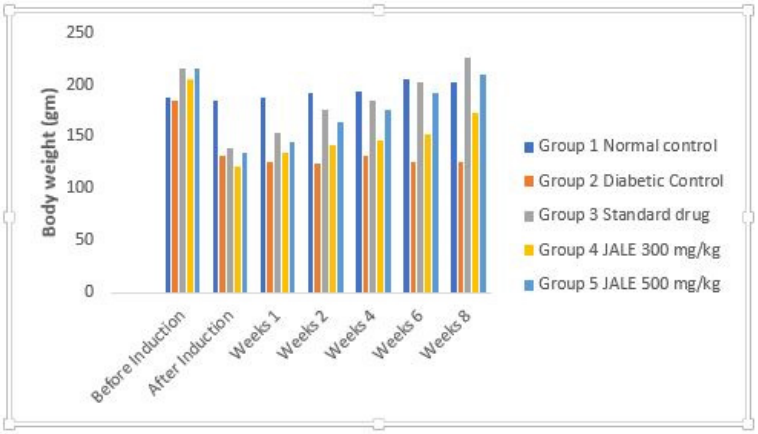

Figure 2: Effect of JALE in Body weight on STZ-diabetic rats.

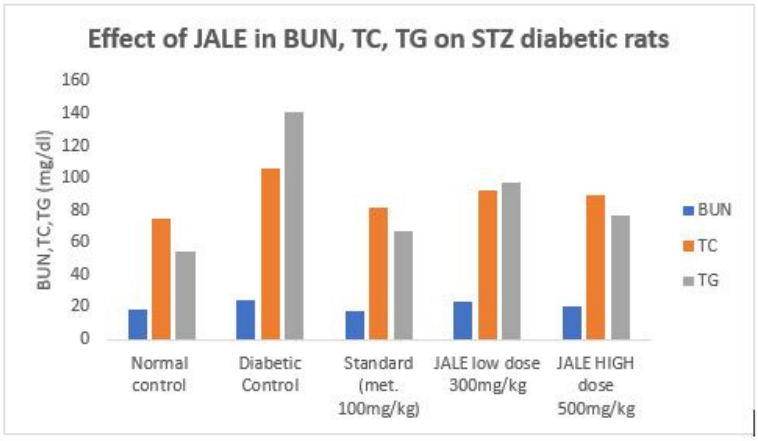

Figure 3: Effect of JALE in BUN, TC, TG on STZ diabetic rats.

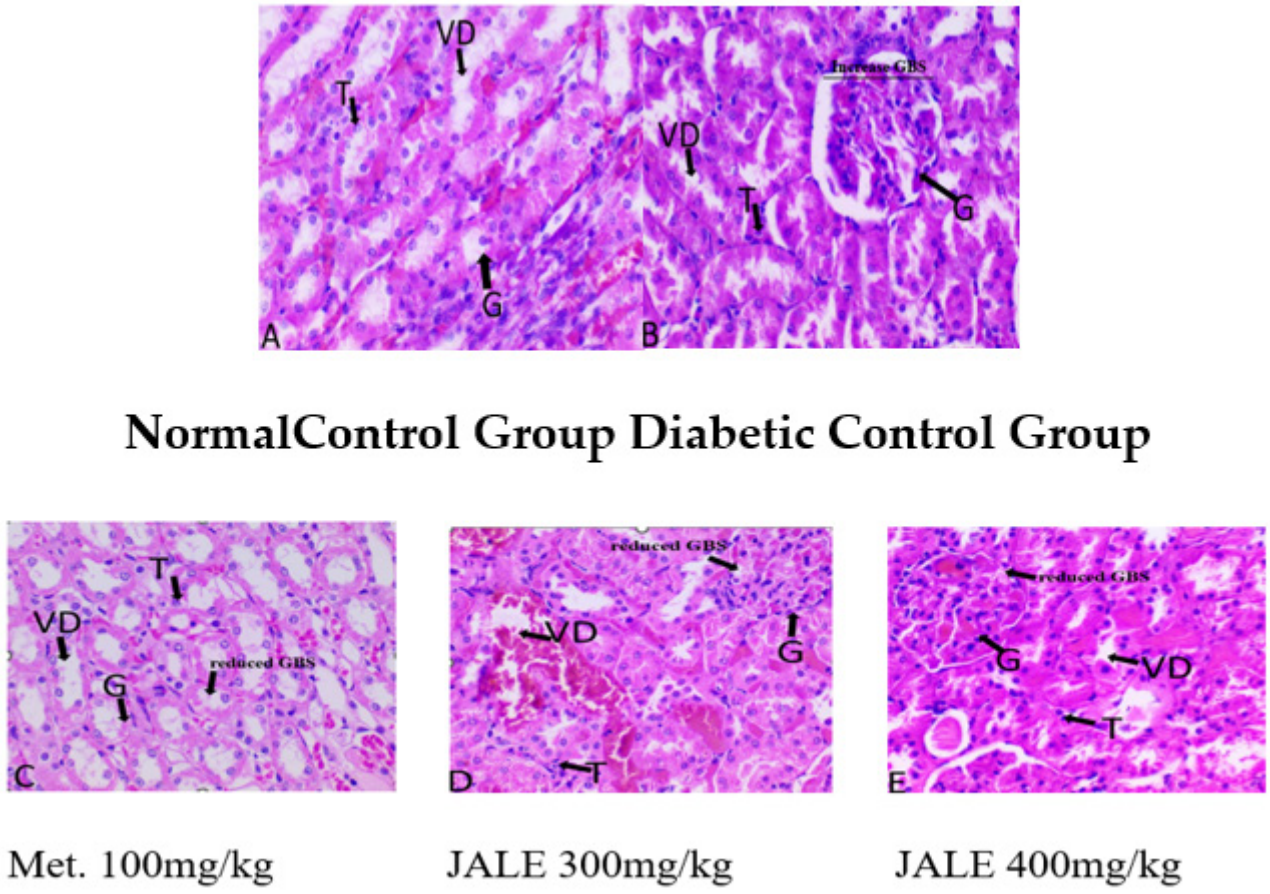

Figure 4: Kidney microscope images (400x magnification using a light microscope with hematoxylin and eosin staining) on STZ induced diabetes in rats. Image A: Control rats; Image B: STZ-diabetic rats; Image C: 100 mg/kg metformin treated group; Image D: 300 mg/kg JALE treated group (low dose); Image E: 500 mg/kg JALE treated group (high dose). GBS: glomeruli Bowman's capsule, T: Renal tubules structure, GS: Glomerular space, VD: Vacuolar degenerated tubules, G: glomerular congestion.

DISCUSSION

T1DM and T2DM are frequently associated with DN, which is another prevalent consequence. The presence of hyperglycaemia brought on by a deficiency in insulin synthesis or resistance define DM. Diabetes affects 537 million persons worldwide between the ages of 20 and 79 and the IDF, projects that number will rise steadily to 643 million by 2030 and to 784 million 2045. It has been determined that it contributes up to 25-40% to CKD, also known as DKD, which is now the main factor of Failure of the kidneys in the entire globe. *Jasminum auriculatum* vahl is an Oleaceae family another name is called Juhi. JALE are full of proteins, tannins, steroids, terpenoids, phenols, flavonoids, alkaloids and carbohydrates, among other polyphenolic substances.

In diabetes modelling, STZ was delivered on the rats used in the current investigation to elicit diabetes. Streptozotocin has been the favoured medication to generate experimental diabetic nephropathy because it has the capacity to trigger a particular cell death of the Pancreatic-β cell that conclusion in separation and a loss of hormone insulin -production function.

Compared to the group of healthy controls, rats receiving streptozotocin 60 mg/kg intravenously dissolved in 0.1 Moller of CB (pH 4.5) had BGL that were considerably higher (250 mg/dL) and they also lost BW $^{###}p<0.001$. The clinical method used in this study is monitored for up to 8 weeks. For the STZ-induced diabetes rats' model, BW and BGL are checked every week when compared to negative control group, the BGL rise and decrease in BW of STZ positive control diabetic rats $^{###}p<0.001$.

STZ induced diabetes is brought on by hyperglycemia, hyperinsulinemia, rise atrophy of muscles and decreased protein in the tissues is linked to a considerable fall in BW, can raise BGL. After treated with JALE 300 mg/kg and 500 mg/kg the observe significantly different in FBG increase and lower the BW of STZ diabetic rats as versus to positive control rats $^{**}p<0.01$; $^{*}p<0.05$, but highly substantially in standard drug (met. 100 mg/kg) group as versus to diabetic rats $^{***}p<0.001$; suggesting a reduced in the risk of muscle tissue damage brought on by hyperglycemia.

Then completing of experimental protocol on STZ, after a 12 hr fast, the rats were given phenobarbital (40 mg/kg) anaesthetic and blood were taken via heart puncture then serum was eliminated by centrifuging blood tests at 4000 rpm for 15 min. It

was then used to analyse the TG, TP, TC, BUN, Scr. Therefore, in the current investigation, rats were given STZ-induced diabetes. Rats receiving STZ had significantly higher parameters BUN, TG, TC level, Scr and reduced TP as versus with negative group (I)$^{###}p<0.001$.

After administered with JALE and standard drug to STZ induced diabetic rats on the completion of 8 weeks experiment, it was seen that the group which were treated with JALE and met. exhibited a substantial difference in serum parameters like Scr level, BUN, TC, TG, reduced and rise TP as compared to diabetic control rats $^{***}p<0.001$ (standard drug metformin 100 mg/kg); $^{**}p<0.01$ (JALE 500 mg/kg) and the low dose of JALE 300 mg/kg significantly low effect on diabetic rats as versus to treated diabetic rats $^{*}p<0.05$.

At the end of the experiment, rats were slaughtered, their kidneys removed and they were given phenobarbital (40 mg/kg) as an amnesty. After being instant preservation in 20% NBF, the renal tissues were dried using a graduated alcohol sequence, integrated with paraffin, cut into 5 mM slices and tarnished using the H and E method. Light microscopy was used to inspect the slides at a 400xmagnification level for any microscopic changes that might have pathological relevance. The glomerular space, glomeruli (G) Bowman capsules, atrophy of the glomerulus observed with dilated GS, glomerular congestion and tubular vacuolation were among the kidney tissues employed for the histological investigation.

Kidney sections from STZ 60 mg/kg treated rats that increased vascular tubular vacuolization, glomerular space and glomeruli (G) Bowman capsule shape, moderate glomerular congestion, increased vacuolar degenerated tubules shown in Figure 4 (B). But the cure of JALE extracts 300 or 500 mg/kg or met. 100 mg/kg for up to 8 weeks restored the aberration in the kidney's morphological architecture. Figure 4 (C, D and E) illustrated the effects of the medication. Following JALE treatment, STZ diabetic rats' kidney sections underwent histopathological analysis and observed reduced GBS, mild glomerular congestion, atrophy of the glomerulus observed with constricted GS and reduced vacuolar degeneration of tubules compared with diabetic rats.

When JALE was administered to diabetic rats, the overall structure was preserved and the GBS was reduced. JALE treatments mitigated these alterations in rat kidney sections. Together, the blood analysis and histological investigation supported the finding that JALE therapy significantly reduced damage to the kidneys in STZ-induced rats with diabetes. Since the nephrons were already injured before treatment and were restored with the help of JALE following treatment, one explanation for this would be that the extract dose exhibits powerful anti-diabetic nephropathy properties.

CONCLUSION

An end stage renal disease condition known as Diabetes nephropathy is characterized like Blood glucose level, BUN, Creatinine level, TC, TG, total protein, body weight is among the tests used to determine the level of serum creatinine and other parameters. The results of the current investigation revealed that JALE extract had a protective effect against diabetic nephropathy in disease rats. When versus to positive control rats, the administration of JALE led to considerably increased BW, decreased BGL and dramatically decreased levels of serum variables such creatinine levels, BUN, total cholesterol, triglycerides and increase total protein. The histopathology study's findings showing the treatment of STZ diabetic rat and observe kidney, demonstrating reduced GBS, glomerular blockages, atrophy of the glomerulus seen with constricted glomerular space, mild glomerular congestion and reduced vacuolar degradation of tubules in comparison to the STZ diabetic rat kidney. The fact that the nephrons were injured before treatment and recovered with the help of JALE after treatment may be one explanation for this. The extract at the tested dose thus have powerful-diabetic nephropathy features.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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ETHICAL ISSUE

The study was conducted as per the guidelines of Institutional Animal Ethics Committee.

ABBREVIATIONS

DN: Diabetic nephropathy; **ESRD:** End stage renal disease; **GBS:** Glomeruli (G) Bowman capsules; **JALE:** *Jasminum auriculatum* vahl; **BUN:** Blood urea nitrogen; **TG:** Tri glyceride; **TP:** Total protein; **Scr:** Serum creatinine; **TC:** Total cholesterol; **GS:** Glomerular space; **met.:** Metformin; **std.:** Standard; **CKD:** Chronic renal failure; **DKD:** Diabetic kidney disease; **RASIs:** Renin-angiotensin system inhibitors; **ARBs:** Angiotensin receptor blockers; **AREIs:** Angiotensin-converting enzyme inhibitors; **BGL:** Blood Glucose Level; **BW:** Body weight; **M:** Molar; **CB:** Citric buffer; **NCG:** Normal control group; **PCG:** Positive control

group; **VDRL:** Veterinary Diagnostic and Research Laboratory; **IAEC:** Institutional Animal Ethical Committee; **AOTS:** Acute Oral toxicity Studies; **NBF:** Neutral buffered formal.

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