Indian Journal of Novel Drug Delivery

IJNDD

An Official Publication of Karnataka Education and Scientific Society

Short Communication

Phytochemical Profiling and Antidiabetic Property of Methanol Extract of *Trewia Nudiflora L.* (Roots & Leaves)

ATIQUR RAHMAN[2], A K AZAD[1, 2], NAZNEEN AHMEDA SULTANA[1, 2], MIZANUR RAHHMAN[3], M KHAIRUZZAMAN[2], JANNATUN FERDOUS[2], SHARIF M SHAHEEN[1]*

[1]Dept. of Pharmacy, Daffodil International University, Dhaka, Bangladesh

[2]Dept. of Pharmacy, Bangladesh University, Dhaka, Bangladesh

[3]Dept. of Pharmacy, University of Rajshahi, Rajshahi, Bangladesh

ARTICLE DETAILS

Article history:
Received on 14 April 2019
Modified on 12 May 2019
Accepted on 18 May 2019

Keywords:
Antidiabetic,
Alloxan,
Blood Glucose,
Trewia Nudiflora L.

ABSTRACT

Metabolic disorders are associated with some major health complications like myocardial infarction, stroke, nephropathy, neuropathy, retinopathy etc. Diabetes is one of the major life threatening metabolic disorder. The present study was designed to evaluate the antidiabetic activity of *Trewia nudiflora L.* and study was carried out on alloxan induced experimental diabetic mice (Swiss albino) for 120 minutes treatment. Experimental methanol extract of root of *T. nudiflora* showed ***P<0.001 indicates significant blood sugar lowering activity at 500mg/kg b.w and mild activity was observed at dose 250mg/kg comparing to diabetic control where metformin was used as reference positive standard. Leaves extract of *T. nudiflora* did not show any antidiabetic activity at both doses 250 and 500mg/kg b.w respectively. The phytochemical screening showed the presence of Glycoside, flavonoid, Tannin and steroid type of compounds. Roots extract possesses anti-diabetic effect which may be mediated through the phytochemical constituents of the plant.

INTRODUCTION

Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic disorders in which there are high blood sugar levels over a prolonged period [1]. Diabetes was one of the first diseases described [2], with an Egyptian manuscript from c. 1500 BCE mentioning "too great emptying of the urine". The first described cases are believed to be of type 1 diabetes. The term "diabetes" or "to pass through" was first used in 230 BCE by the Greek Apollonius of Memphis [3]. Indian physicians around the same time identified the disease and classified it as madhumeha or "honey urine", noting the urine would attract ants [3, 4]. Symptoms of high blood sugar include frequent urination, increased thirst, and increased hunger. Serious long-term complications include cardiovascular disease, stroke, chronic kidney disease, foot ulcers, and damage to the eyes.

Author for Correspondence:
Email: sharif.ph@diu.edu.bd

There are three main types of diabetes mellitus: Type 1 DM results from the pancreas's failure to produce enough insulin due to loss of beta cells. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes". The cause is unknown. Type 2 DM begin with insulin resistance, a condition in which cells fail to respond to insulin properly. This form was previously referred to as "non insulin-dependent diabetes mellitus" (NIDDM) or "adult-onset diabetes". The most common cause is excessive body weight and insufficient exercise. Gestational diabetes is the third main form, and occurs when pregnant women without a previous history of diabetes develop high blood sugar levels. Type 1 DM must be managed with insulin injections [5]. Acute complications can include diabetic ketoacidosis, hyperosmolar hyperglycemic state, or death [6]. Diabetes is due to either the pancreas not producing enough insulin, or the cells of the body not responding properly to the insulin produced [7]. As the disease progresses a lack of insulin may also develop [8]. Type 2 DM may be treated with medications with or without insulin [9]. Low blood sugar (hypoglycemia), is common in

persons with type 1 and type 2 DM [10]. People (usually with type 1 DM) may also experience episodes of diabetic ketoacidosis, a metabolic disturbance characterized by nausea, vomiting and abdominal pain, the smell of acetone on the breath, deep breathing known as Kussmaul breathing, and in severe cases a decreased level of consciousness [11]. Diabetes mellitus is classified into four broad categories: type 1, type 2, gestational diabetes, and "other specific types". The "other specific types" are a collection of a few dozen individual causes [12].

MATERIAL AND METHODS

Sample Collection Preparation of Crude Extracts

The collected plant *Trewia nudiflora L* roots and leaves (Natore, Bangladesh) ware dried at room temperature (30 ± 3°C), to ensure the active constituents free from decomposition. The dried leaves and roots were powdered in an electrical grinder after overnight drying in an oven below 50° C. The powders were extracted with methanol at room temperature at two different bottles. The bottles were kept at room temperature and allowed to stand for 12 days with occasional shaking. When the solvent become concentrated, the liquid alcohol contents were filtered through cotton & then through filter paper (Whatman Filter Paper No. 1). Then, the solvents were allowed to evaporate using rotary evaporator at temperature 40-45°C. Finally, a highly concentrated methanolic crude extracts were obtained.

Phytochemical Screening

Phytochemical analysis was performed according to the standard methods described by Nayek and Pereira [13].

Drugs and Chemicals

The standard drug, Metformin hydrochloride was the generous gift sample from Square Pharmaceuticals Ltd. Pabna Bangladesh. Alloxan monohydrate was purchased from Loba Chemie, India. Blood samples analyzed for blood glucose content by using OK meter Match glucose test meter (Hsinchu, Taiwan).

Induction of Diabetes and Experimental Design

Eight week-old Swiss albino mice (27-30g) purchased from Jahangir nagar University, Dhaka, Bangladesh and were housed in animals cages under standard environmental conditions (22-25°C, humidity 60-70%, 12 hr light: 12 hr dark cycle). The animals used in this study were cared in accordance with the guidelines on animal experimentation of our institute.

For the development of diabetic model, mice were grouped into five groups. Each group contains four mice, n=4. After overnight fasting, a freshly prepared solution of alloxan monohydrate (120 mg/kg body weight in normal saline) was administered intraperitoneally into group II-V. Group I kept as normal control group that did not receive the chemical and Group II served as diabetic control group. Group IV and V received Trewia nudiflora L extracts per oral at dose 250 and 500mg/kg body weight. The blood samples were analyzed for blood glucose content at 0, 30, 60, 90 and 120 minutes respectively. Mice with blood glucose levels above 11.1 mM/L were selected for the study [14].

RESULTS

Table 1: Phytochemical test results of roots and leaves extract of *Trewia nudiflora (L.)*

Tested groups	Root	Leaves
Alkaloid	-	-
Carbohydrates	+	+
Flavonoids	++	+
Phenols	-	-
Glycosides	+	-
Tannin	++	+
Steroids	+	+

Note: (+) Indicates the presence of the tested group, (−) Indicates the absence of the tested group.

DISCUSSION

Type 2 diabetes mellitus is one of the leading causes of renal failure, ASCVD, non-traumatic lower limb amputation, blindness, and death worldwide [15]. By the year 2030, >70% of people with T2DM shall reside in developing countries [16]. Primary prevention of T2DM should be an urgent public health policy. The disease predominantly affects working-age people and therefore has a counterproductive economic impact, compounded by the frequent occurrence and interaction of T2DM with infectious diseases (such as AIDS and tuberculosis) [17]. Several options for pharmacologic therapy of lowering blood glucose are currently available, which have revolutionized long-term management of DM [18]. Several antidiabetic drugs may have important CV complications, which the provider team should always be aware [19]. Drug repurposing of

the anti-inflammatory agent for aphthous stomatitis, amlexanox, is currently undergoing trials as newer agents for management of diabetes [20].

Table 2: Antidiabetic effect of roots extract of *T. nudiflora* L. on alloxan induced diabetic mice.

Time	Blood glucose level (mM/L)				
	Groups				
	Normal Control	Diabetes Control Group	Standard Group (Metformin)	*T. nudiflora* Roots Extract (250 mg/kg)	*T. nudiflora* Roots Extract (500 mg/kg)
0 min	5.56±0.51	23.10 ±0.42	22.50±0.44	21.4±0.41	22.8±0.26
30 min	5.24±0.44	24.10±0.53	20.25±0.21	19.9±0.33	19.9±0.25
60 min	5.8±0.45	23.40±0.24	13.21±0.34***	17.5±0.25	14.2±0.44***
90 min	6.1±0.52	22.30±0.56	10.20±0.22***	16.4±0.43	12.7±0.23***
120 min	5.7±0.12	21.00±0.54	8.34±0.41***	15.1±0.24	12.2±0.65***

Values are mean ± SEM, where ***P<0.001 indicates significant activity comparing to diabetic control group where n=4

Table 3: Antidiabetic effect of leaves extract of *T. nudiflora* L. on alloxan induced diabetic mice.

Time	Blood glucose level (mM/L)				
	Groups				
	Normal Control	Diabetes Control Group	Standard Group (Metformin)	TN Leaves Extract (250 mg/kg)	TN Leaves Extract (500 mg/kg)
0 min	5.56±0.51	23.03 ±0.42	22.50±0.44	26.5±0.32	25.8±0.51
30 min	5.24±0.44	24.10±0.53	20.25±0.21	25.9±0.26	24.8±0.42
60 min	5.8±0.45	23.40±0.24	13.21±0.34***	25.4±0.31	23.9±0.23
90 min	6.1±0.52	22.30±0.56	10.20±0.22***	24.5±0.22	19.2±0.27
120 min	5.7±0.12	21.00±0.54	8.34±0.41***	24.3±0.46	18.9±0.24

Values are mean ± SEM, where ***P<0.001 indicates significant activity comparing with diabetic control group where n=4, TN=*T. nudiflora*

CONCLUSION

In the context of the above result and discussion it can be said that the methanolic root extract of *T. nudiflora* possesses significant antidiabetic activity compared to standard Metformin hydrochloride but fealf extract showd no activity. In conclusion, further study is needed to investigate the causative component(s), and mechanism of action of it.

ACKNOWLEDGEMENT

I wish to thank Bangladesh University authority, Dhaka, for their support to complete this research successfully.

REFFERENCE

[1] "About diabetes". World Health Organization. Archived from the original on 31 March 2014. Retrieved 4 April 2014.

[2] Ripoll, Brian C. Leutholtz, Ignacio (2011-04-25). Exercise and disease management (2nd ed.). Boca Raton: CRC Press. p. 25.

[3] Leonid Poretsky, (2009). Principles of diabetes mellitus (2nd ed.). New York: Springer. p. 3.

[4] Roberts, Jacob (2015). "Sickening sweet". Distillations. **1** (4): 12–15. Retrieved 20 March 2018.

[5] .WHO. October 2013. Archived from the original on 26 August 2013.Retrieved 25 March 2014.

[6] Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN (July 2009). "Hyperglycemic crises in adult patients with diabetes". Diabetes Care. **32** (7): 1335–43.

[7] Shoback DG, Gardner D, eds. (2011). "Chapter 17". Greenspan's basic & clinical endocrinology (9th ed.). New York: McGraw-Hill Medical.

[8] RSSDI textbook of diabetes mellitus (Rev. 2nd ed.). Jaypee Brothers Medical Publishers. 2012. p. 235.

[9] World Health Organization. October 2013. Archived from the original on 30 May 2017.

[10] Kenny C (April 2014). "When hypoglycemia is not obvious: diagnosing and treating under-recognized and undisclosed hypoglycemia". Primary Care Diabetes. **8** (1): 3–11.
[11] Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN (July 2009). "Hyperglycemic crises in adult patients with diabetes". Diabetes Care. **32** (7): 1335–43.
[12] Shoback DG, Gardner D, eds. (2011). "Chapter 17". Greenspan's basic & clinical endocrinology (9th ed.). New York: McGraw-Hill Medical.
[13] Kokate, C.K.,. Practical Pharmacognosy. New Delhi: Vallabh Prakashan, 1994, pp: 107-107.
[14] Nagappa AN, Thakurdesai PA, Rao VN, Singh J (2003). Antidiabetic activity of Terminalia catappa Linn. fruits. J. Ethnopharmacol., 88(1): 45-50.
[15] Al-Arouj M, Bouguerra R, Buse J, Hafez S, Hassanein M, Ibrahim-Asharaf M, et al. Recommendations for management of diabetes during Ramadan. Diabetes Care (2005) 28:2305–11.10.2337.
[16] .Echouffo-Tcheugui JB, Dagogo-Jack S. Preventing diabetes mellitus in developing countries. Nat Rev Endocrinol (2012) 8(9):557–62; Erratum in: Nat Rev Endocrinol (2012) 8(11):692.10.1038.
[17] [17] Ronacher K, Joosten SA, van Crevel R, Dockrell HM, Walzl G, Ottenhoff TH. Acquired immune deficiencies and tuberculosis: focus on HIV/AIDS and diabetes mellitus. Immunol Rev (2015) 264(1):121–37.10.1111.
[18] Garber AJ, Abrahamson MJ, Barzilay JI, Blonde L, Bloomgarden ZT, Bush MA, et al. Consensus statement by the American Association of Clinical Endocrinologists and American College of Endocrinology on the comprehensive type 2 diabetes management algorithm-2016 executive summary. Endocr Pract (2016) 22(1):84–113.
[19] Ferrannini E, De Fronzo RA. Impact of glucose-lowering drugs on cardiovascular disease in type 2 diabetes. Eur Heart J (2015) 36(34):2288–96.10.1093.
[20] Koch L. Obesity: teaching an old drug new tricks – amlexanox targets inflammation to improve metabolic dysfunction. Nat Rev Endocrinol (2013) 9(4):185.10.1038.