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Hypoglycaemic Effect of Curry Tree Bark (*Murraya koenigii*) Water Extract in Type 2 Diabetic Patients

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ABSTRACT

The various plant products like herbs, fruits and vegetables have been used by man since times immemorial for their extraordinary healing abilities. Type 2 diabetes is the commonest form of diabetes constituting 90% of the diabetic population in any country. The global prevalence of diabetes is estimated to increase, from 4% in 1995 to 5.4% by the year 2025. Broad researches on diabetes lead to a number of synthetic oral hypoglycemic agents like biguanides, sulphonylureas and thiozolidinediones being used to treat diabetes. But all have side effects associated with their uses. Modern traditional medicines owe a large to tribal medicines and many researches are being conducted for scientific explanations. However, herbal principles can be safely analyzed for future acceptability in majority of Indians as alternative medicines of choice. *Murraya koenigii* has been emerged as an antidiabetic agent for some years. Its leaves were used traditionally in Indian Ayurvedic system to treat diabetes but the effect of its bark is still not explored very much. The purpose of the study is to investigate the Antidiabetic effect of curry tree bark. Different doses of curry tree bark water extract were supplemented in the form of capsules to total 10 type 2 diabetic subjects of Banasthali campus. Fasting blood sugar, post prandial blood glucose level and glycosylated haemoglobin were measured in the diabetic and non-diabetic subjects. The 30 days supplementation showed a marked reduction in blood glucose levels. In the diabetic subjects, the elevated fasting blood sugar and post prandial blood glucose level were reduced and glycosylated haemoglobin remained stabilized.

Keywords: *Anti-diabetic effect, curry tree bark, water extract, fasting blood glucose level, glycosylated haemoglobin,post prandial blood glucose level.*

According to the World Health Organization estimates, India had 32 million diabetic subjects in the year 2000 and this number would increase to 80 million by the year 2030.The International Diabetes Federation (IDF) also reported that the total number of diabetic subjects in India is 41 million in 2006 and that this would rise to 70 million by the year 2025. Studies on migrant Indians have shown that they have a higher predisposition to insulin resistance, type 2 diabetes and coronary artery disease compared to other ethnic groups. The so called "Asian Indian Phenotype" refers to certain uniqueclinical and biochemical abnormalities in Asian Indians and this constellation of abnormalities is considered to be one of the major factors contributing to increased prevalence of type2 diabetes in Asian Indians. T 2 DM is a non-autoimmune, complex, heterogeneous and polygenic metabolic disease condition in which the body fails to produce enough insulin, characterized by abnormal glucose homeostasis (**Gupta et al, 2008**). Its pathogenesis appears to involve complex interactions between genetic and environmental factors (**Gupta et al, 2011**). Current drugs used for the treatment of diabetes include a few groups of chemical compounds which have many side effects also. Their long term use causes diarrhea, anorexia, nausea, metallic taste, weight gain, hypoglycaemia, increased cardiovascular disease risk, flatulence, abdominal distension, fluid retention, anaemia etc. Some medicines are harmful for the patients with kidney disease. Few medicines reduce blood sugar level by slowing down the breakdown of complex carbohydrate into simpler carbohydrates but they do not affect glucose utilization and insulin secretion (**Permutt etal, 2005**). Since ancient times, plants have been an exemplary source of medicine. Ayurveda and other Indian literature mentioned the uses of plants in treatment of various human ailments. India has

about 45000 plant species and among them, several thousands have been claimed to possess medicinal properties. India unquestionably occupies the top most position in the use of herbal drugs since ancient times utilizing nearly 600 plant species indifferent formulations. Great majorities of people in India have been depending on crude drugs for the treatment of various diseases as evidenced from well-documented indigenous system of medicines, Ayurveda and Unani. This is more striking when we consider the fact that approximately 80% of the people living in less developed countriesrely exclusively on traditional medicine for their health care needs. Plant extract or different folk plant preparations are being prescribed by the traditional practioners and also accepted by the users for diabetes like for any other diseases in many countries especially in third world countries. Now-a day's more than 400 plants are beingused in different forms for hypoglycaemic effects all the claims practitioners or users are neither baseless nor absolutely. Therefore, a proper scientific evaluation and screening of plant by pharmacological tests followed by chemical investigations is necessary (**Wadker et al, 2007**). Researchers conducted in last few decades on plants, mentioned in ancient literature or used traditionally for diabetes have shown anti-diabetic property. Ayurveda and other traditional approaches had described anti-diabetic potentials in more than 800 plants in the Indian sub-continent .Indian plants which are most effective and the most commonly studied in relation to diabetes and their complications are: Banyan tree, Currey leaves, Jamun seeds and leaves, Bitter gourd, gurmur, Allium cepa, Allium sativum, Aloe vera,Cajanus cajan, Coccinia indica, Caesalpinia bonducella, Ficus bengalenesis, Gymnemasylvestre, Momordica charantia, Ocimum sanctum, Pterocarpus marsupium, Swertiachirayita, Syzigium cumini, Tinospora cordifolia and Trigonella foenum graecum. All plants have shown varying degree of hypoglycaemic and anti-hyperglycaemic activity (**Grover, 2002**). Curry leaf (*Murraya koenigii*) contains special compounds that inhibit alpha amylase. This means that the rate at which starch is broken to glucose can be slowed by inhibiting the metabolic reaction of the alpha amylase enzyme. This is potentially a breakthrough for diabetes sufferers. Slowing the rate of starch breakdown, by blocking the alpha-amylase enzyme, can lower the rate at which glucose enters the bloodstream from the intestine. This breakthrough could lead to the development of a new drug for diabetes. (**Mitra, 2007)** *Murraya koenigii* is an aromatic leaf tree, often used in Indian cuisine. It is native to India. It is a tropical to sub-tropical tree in the family Rutaceae. The leaves of *Murrayakoenigii* are also used as an herb in Ayurvedic medicine. Very few studies are available upon the anti-diabetic effect of *Murraya koenigii*. A carbazole alkaloid, named, "Mahanimbine" is present in leaves, stem, bark and root of *Murrayakoenigii*. The carbazole alkaloids has been reported for their various pharmacological activities such as anti-tumor, anti-viral, anti-inflammatory, diuretic and anti-oxidant activities. It has beneficial effect in the management of diabetes associated with abnormal lipid profile and related cardiovascular complications. (**Kaur, 2011**) Studies indicated that *M.koenigii* possess hypoglycaemic activity, decreased glycogenolysis and gluconeogenesis properties and also finds its application as an adjuvant to dietary therapy and drug treatment for controlling Diabetes Mellitus. This plant is promising as it is widely and regularly used as a spice for food flavouring and without any side effects. Adequate characterization of hypoglycaemic activity of aqueous extract has not been yet done, as no such reports are available in the literature though the activity is reported. The scientific evaluation of its hypoglycaemic activity was, therefore, explored. (**Kesari, 2005**).Though so many studies are done to explore the antidiabetic property of curry leaves, very few studies are done on curry bark. Aim of the study is to investigate the effect of curry tree bark on glycaemic control in type 2 diabetic patients.

MATERIAL AND METHODS

The curry tree bark was collected from the curry trees of Banasthali campus. Chemicals used for the study were all of analytical grade.

Preparation of water extract powder of curry tree bark

Curry tree bark was firstly peeled superficially with the help of sharp knife and then shade dried. It was then grinded to the powder from in a mixer grinder. The powder was dipped in a glass beaker containing water, 8 times of total amount of powder. After 24 hours the beaker was put on the water bath to make the volume ¼ of the total. It was then strained. This strained water then again put on the water bath until semisolid

consistency was observed. Then the same beaker was kept in oven at 40ºC till the total moisture get evaporated and powder is left. The powder was then put out and collected in an air tight jar.

Preparation of capsules

Simple capsule covers were purchased from the medical store of Banasthali University. Capsules were filled with the curry tree bark water extract. An amount of 0.1 g was weighed in the lab using electronic weighing machine. All the capsules were filled manually with the help of spatula. 30 capsules were packed zip lock covers and stored at room temperature.

Selection of type 2 diabetic subject

Sampling was done in Banasthali University in order to select Type 2 diabetic subjects. 20 Type 2 diabetic subjects were selected through purposive sampling which were randomly divided into 2 groups i.e. 10 in experimental group and 10 in control group.

Biochemical evaluation

Fasting blood glucose level, post prandial blood glucose level and glycosylated haemoglobin level of diabetic subjects was checked before and after the supplementation. The glucose level was estimated by GOD/POD enzymatic method, based on end point calorimetric and glycosylated haemoglobin (HbA1C) by Ion exchange Resin method.

Supplementation

The supplementation of curry tree bark water extract (0.1g/day) was done in the form of filled capsules on a daily basis. The experimental group were given one capsule daily for 30 days and the placebo (control) group was given plain capsules for the same time period.

Statistical Analysis

The data were processed for the analysis of mean and standard deviation by Microsoft office excel.

RESULTS AND DISCUSSION

Effect of curry tree bark water extract supplementation on fasting Blood glucose level

Curry tree bark water extract powder was supplemented (0.1 g/day) for a period of 1 month to 10 diabetic patients. Before supplementation, the mean fasting blood glucose level of control group and experimental group was 143.03 ± 24.66 mg /dl and 142.80 ± 25.55 mg/dl respectively.

After 30 days the mean value of control group was estimated to be 147.25±28.19 and of experimental group was 136.70±27.08. The difference was 4.22 in control group and 6.10 in experimental group.

Effect of curry tree bark water extract supplementation on post prandial blood glucose level

When post prandial blood glucose level was checked the mean value of control and experimental group was 161.15±24.79 mg/dl and 168.19±58.20 mg/dl respectively. The supplementation of *Murraya koenigii* water extract capsules resulted in significant reduction in the post prandial blood glucose level of the experimental group was 167.23±53.28mg/dl in comparison to the control group (165.89±22.92 mg/dl).

Effect of curry tree bark water extract supplementation on glycosylated haemoglobin:

The pre-supplementation mean value of control group was 7.60±2.46% and of experimental group was 7.53±2.53%. After supplementation, the glycosylated haemoglobin was stabilized and insignificant difference was found between pre and post analysis in experimental group 7.49±2.48% while the level was increased in the control group 8.0±2.49%.

Conclusion

All the selected diabetic subjects were divided into two groups, control and experimental. Control group was kept on placebo, while the experimental group was given *Murraya koenigii* water extract in the form of capsules for 30 days with each capsule weighing 0.1 g/day. Biochemical testing was done before and after supplementation. The results were concluded then.

The results show that the supplementation lowered the fasting and post prandial blood glucose level of the experimental group to a significant level. The glycosylated haemoglobin level of the control group subjects increased during intervention. In experimental group neither increased nor decreased was seen and insignificant difference was found between pre and post analysis.

Thus, the results of this study showed a hypoglycaemic effect of *Murraya koenigii* in type 2 diabetic patients.

Table: 1 Mean Fasting blood glucose level of subjects (mg/dl)

Groups	Pre mean+ SD	Post	Difference	Paired 't' test
Experimental	142.80±25.55	136.70±27.08	- 6.10	6.76*
Control	143.03±24.66	147.25±28.19	+ 4.22	2.14ns

* Significant at 0.05 level

Table: 2 Mean Post-Prandial blood glucose level of subjects (mg/dl)

Groups	Pre Supplementation	Post supplementation	Difference	Paired't' test
Experimental	168.19±58.20	167.23±53.28	- 0.96	7.15*
Control	161.15±24.79	165.89±22.92	+4.74	2.13 ns

* Significant at 0.05 level

Table: 3 Glycosylated haemoglobin level (%)

Groups	Pre Supplementation	Post Supplementation	Difference	Paired't' test
Experimental	7.53±2.53	7.49±2.48	0.04	2.24 ns
Control	7.60±2.46	8.0±2.49	0.40	2.24 ns

Ns –non- significant

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