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Research Article

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Effect of Supplementation of Tulsi Leaves or Curry Leaves or Combination of both Type 2 Diabetes

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ABSTRACT

India has the largest diabetic population, over 220 million people worldwide have diabetes. India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the "diabetes capital of the world". It was estimated that there are approximately 33 million adults with diabetes in India. This number is likely to increase to 57.2 Million by the year 2025.Diabetes mellitus today is recognized as an epidemic disease in most countries that are undergoing socioeconomic transitions Diabetes being a chronic disorder requires combination of therapies, so a therapy which could be used adjunct with medicines which has an antioxidant and antidiabetic activity as well as is cost effective would be more beneficial. Medicinal plants were used for the very reason that they were available easily and cost effective. This review presently focusses on the effect of supplementation of the powdered curry leaves on the type 2 diabetics and to find out its hypoglycaemic potential. In this study a small pilot study was conducted to find out the efficacy of Curry leaves and tulsi leaves. The pilot study was done on 15 subjects categorized into experimental group and were administrated 2g of the powdered tulsi leaves/Curry leaves/Tulsi+Curry leaves and another 15 subjects in control group. Best out of the 3 supplements was used in the main study. The main study was conducted on 60 subjects, divided again into control group and experimental groups. The results were compared pre and post supplementation to meet the objectives of the study.

***Keywords**: Diabetes, Curry leaves, Type 2 Diabetes, Tulsi leaves.*

INTRODUCTION

Inthe year 1999, World Health Organisation defined Diabetes as a metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. Diabetes mellitus today is recognized as an epidemic disease in most countries that are undergoing socioeconomic transitions[5]. Diabetes is a multifactorial disease leading in several complications and therefore demands a multiple therapeutic approach. As it is a chronic disorder several therapies are used in the treatment but there are certain limitations due to high cost and side effects such as development of hypoglycaemia, weight gain, gastrointestinal disturbances[4].

India has the largest diabetic population[12]. Over 220 million people worldwide have diabetes. India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the "diabetes capital of the world". According to the Diabetes Atlas 2006 published by the International Diabetes Federation, the number of people with diabetes in India currently around 40.9 million is expected to rise to 69.9 million by 2025 unless urgent preventive steps are taken.

The so called "Asian Indian Phenotype" referred to certain unique clinical and biochemical abnormalities in Indians which included increased insulin resistance, greater abdominal adiposity i.e., higher waist circumference despite lower body mass index, lower adiponectin and higher high sensitive C-reactive protein levels. This phenotype made Asian Indians more prone to diabetes and premature coronary artery disease. At least a part of this was due to genetic factors. However, the primary driver of the epidemic of diabetes is the rapid epidemiological transition associated with changes in dietary patterns and decreased physical activity as evident from the higher prevalence of diabetes in the urban population. Even though the prevalence of microvascular complications of diabetes like retinopathy and nephropathy were comparatively lower in Indians, the prevalence of premature coronary artery disease was much higher in Indians compared to other ethnic groups. This might have long lasting adverse effects on nation's health and economy[9].

In a study it was estimated that, 1.1 million people died from diabetes (the actual number is much higher because people may live for years with diabetes and their cause of death is often recorded as heart disease or kidney failure – brought on by their diabetes.) Data showed that nearly 80% of diabetes deaths occurred in low- and middle income countries. About half of diabetes deaths occur in people under the age of 70 years; 55% of diabetes deaths were in women. The WHO projects that diabetes deaths will double between 2005 and 2030[13].

More than 400 traditional plant treatment for diabetes mellitus had been recorded, but only small number of these have received scientific and medical evaluation to assess their efficacy. Diabetes being a chronic disorder requires combination of therapies, so a therapy which could be used adjunct with medicines which has an antioxidant and antidiabetic activity as well as is cost effective would be more beneficial. Therefore medicinal plants were looked onto for the very reasons stated above. They were easily available and also had been used over several years in Ayurveda. Even WHO expert committee on diabetes has recommended that traditional medicinal herbs has to be further investigated[7]. In the same year Kashikar et al, reviewed the traditional herbs that had shown the diabetic property and had hypoglycaemic potential.

Singh *et al*,[11] concluded that considering the health benefits of Tulsi our ancestors in India insisted to have a Tulsi sapling in everyone's house. Keeping the various medical benefits in view, investigations were called for to be attempted towards purifications of Tulsi components and their characterization in terms of chemical natures and bio-pharmacological activities.

Diabetes is a disease of great importance from the socio-medical point of view. It is a disease of complications. This disease is very common in India, although the modern allopathic system of medicine was greatly accepted in the treatment of diabetes throughout the world; it has not been able to reach the remote rural areas for various reasons. In our country a large majority of our people cannot afford the expenses of elaborate methods of treatment.

Diabetes mellitus today is recognized as an epidemic disease in most countries that are undergoing socioeconomic transitions[5].

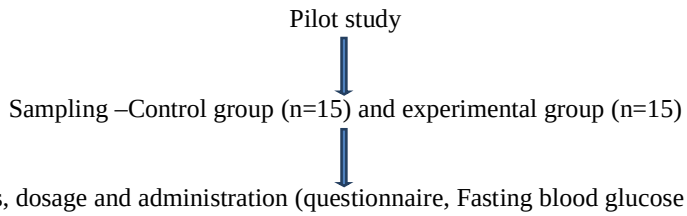
MATERIALS AND METHODS

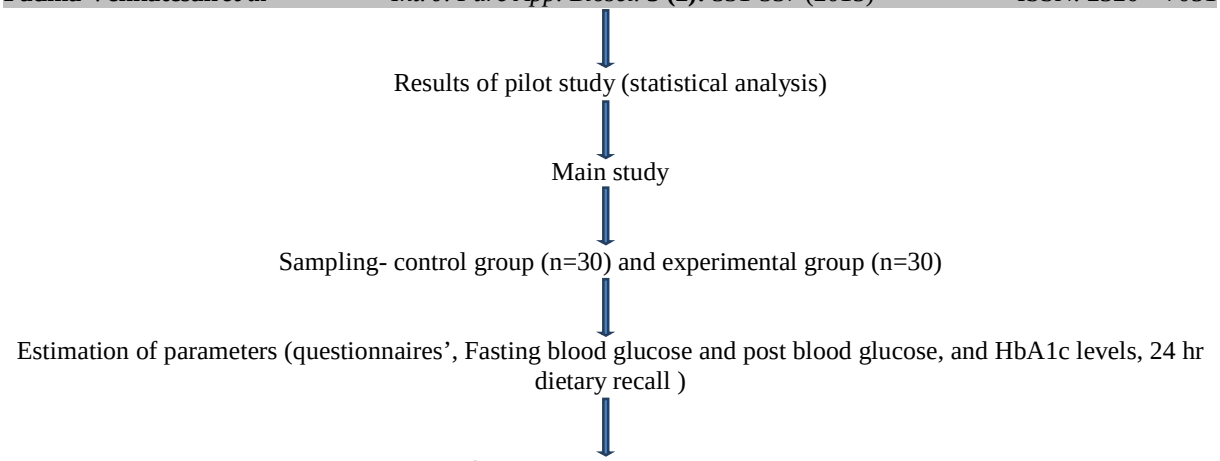
Materials:

Tulsi leaves and Curry leaves were washed thoroughly and sun dried for 3 days. After 3 days it was made into fine powder. The powder was weighed before and put into zip lock packets so as to prevent it from contamination, therefore increasing its shelf life.

Methods:

Schematic representation





RESULTS AND DISCUSSION

Demographic data:

Table 4.1 Demographic Data of the subjects

			Grp		
			1 Control	2 Experimental	Total
Gender	1 Male	Count	14	14	28
		% within Grp	46.7%	46.7%	46.7%
	2 Female	Count	16	16	32
		% within Grp	53.3%	53.3%	53.3%
Total		Count	30	30	60
		% within Grp	100.0%	100.0%	100.0%

In the main study, new batch of 60 subjects were selected using convenience sampling. The samples were selected according to the inclusion criteria and were divided into experimental group and control group. The experimental group consisted of 30 type 2 diabetics while rest in the control group. The subjects of the experimental group were given 2g of powdered curry leaves daily for 3 months to see its effect on the blood glucose level and HbA1c values of the type 2 diabetics. The control group was not given any treatment.

According to the table 4.7, both experimental group and control group had majority of female subjects than male subjects. It observed that both the groups had 53.3% of females while only 46.7% of them were males

Biochemical analysis:

Table 4.2: Paired Samples Statistics

		Mean	N	Std. Deviation
Pair 1	Pre_FBG	168.846	30	33.718
	Post_FBG	141.55	30	29.095
Pair 2	Pre_PBG	159.84	30	56.311
	Post_PBG	163.51	30	45.372
Pair 3	Pre_HbA1c	6.2967	30	1.26177
	PO_HbA1	5.07	30	1.20413

In the main study as stated in the demographic data, 60 subjects were divided into experimental group and control group. The experimental group had 30 subjects which were administered 2g/day of powdered curry leaves to observe its effect on the blood glucose levels and the HbA1c values. Fasting blood glucose and post prandial blood glucose levels were estimated through enzymatic-GOD-POD technique, a standard technique used to assess the sugar levels. From the above table it was observed that pre supplementation the mean of fasting blood glucose level was 168.84± 33.71 which significantly lowered to 141.55 ± 29.09 post the supplementation of powdered curry leaves of 2g/d for 3 months. It was seen that the post prandial blood glucose levels of the subjects was 159.84 ±56.31 before the supplementation and it increased to 163.51± 45.37 after the supplementation. Also the HbA1c levels of the subjects was analysed it was seen that pre HbA1c levels of the subjects was 6.2967 ±1.261 while after the supplementation it considerably lowered to 5.07 ±1.204 which exhibited the hypoglycaemic potential of the curry leaves.

Bennett *et al*[2] in the year 2007, assessed the validity of the HbA1c as screening tool for early detection of the type 2 diabetes. It was concluded that both the HbA1c and Fasting plasma glucose levels are effective tools for detection of early type 2 DM.

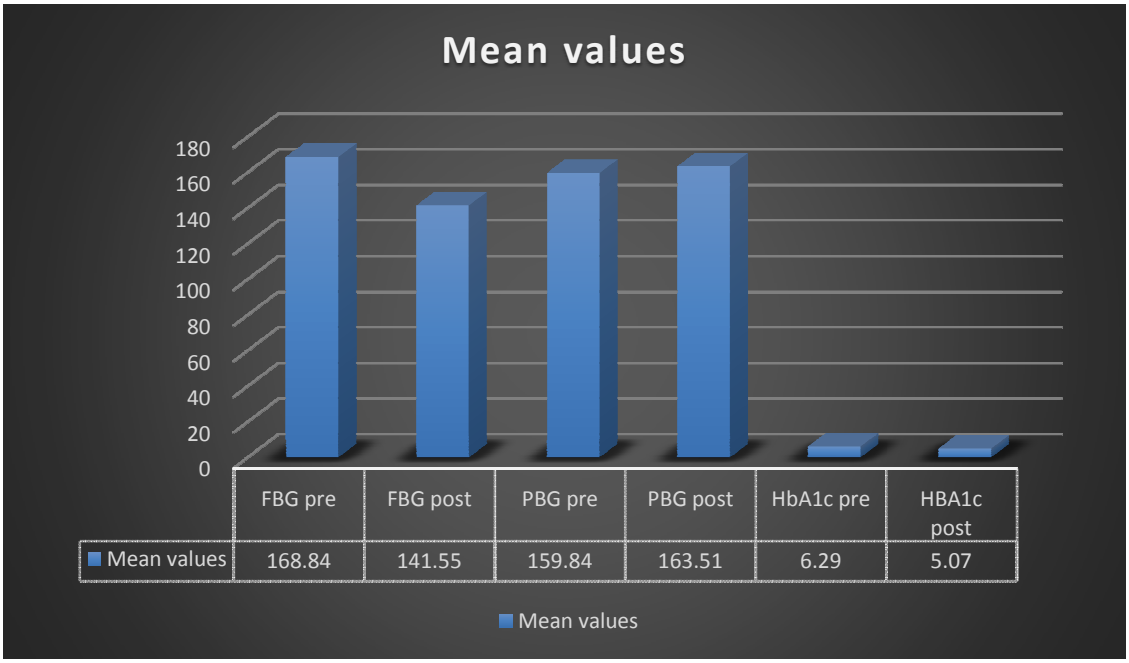
Control Group:

Table 4.3: changes in control group

Control Group	Mean	N	S.D
Pre_FBG	140.78	30	39.79
Post_FBG	139.02	30	43.52
Pre_PBG	166.34	30	36.960
Post_PBG	172.58	30	50.78
Pre_hbA1c	6.29	30	1.14
Post_hbA1c	6.72	30	1.24

Similarly in the control group the mean value of the Pre FBG was 140.78±39.79 which decreased to 139.02 after 3 months without any supplementation and the Pre PBG was 166.34 prior which increased to 172.58±50.78 after 3 months. The mean value of pre hbA1c was 6.29±1.14 which increased to 6.72±1.24. From the data above it was clearly evident, that post supplementation the results were effective than the results of the control group.

Graph 3.1: *changes in the blood glucose levels*



24 dietary recall:

Table 4.4: comparison of the energy and macronutrients between the control group and experimental group

Nutrients	Groups	N	Mean	Standard Deviation
Energy	1 Control	30	1722.613	229.21181
	2 Experimental	30	1685.3533	277.04448
CHO	1 Control	30	269.7100	35.44463
	2 Experimental	30	254.6177	54.02433
Protein	1 Control	30	59.7711	12.13979
	2 Experimental	30	53.8227	14.36090
Fat	1 Control	30	44.9753	12.18741
	2 Experimental	30	50.2777	12.39749

Susan et al, in the year 2001 reviewed the effectiveness of the self-management training in type 2 diabetics. In her study she carried out a intervention based on educational focus (information, lifestyle behaviors, mechanical skills, and coping skills), and outcomes were classified as knowledge, attitudes, and self-care skills; lifestyle behaviours, psychological outcomes, and quality of life; glycaemic control; cardiovascular disease risk factors; and economic measures and health service utilization. It was seen that the positive effects of self-management training on knowledge, frequency and accuracy of self-monitoring of blood glucose, self-reported dietary habits, and glycemic control were demonstrated in studies with short follow-up (<6 months). Effects of interventions on lipids, physical activity, weight, and blood pressure were variable. Although evidence suggests the effectiveness of the self-management in type 2 diabetes further research is needed to assess the effectiveness of self-management interventions on sustained glycaemic control, cardiovascular disease risk factors, and ultimately, microvascular and cardiovascular disease and quality of life.

Diet and nutrition was widely believed to play an important part in the development of Type II (non-insulin-dependent) diabetes mellitus, findings indicated that a higher intake of polyunsaturated fat and possibly long-chain n-3 fatty acids may be beneficial, whereas a higher intake of saturated fat and trans-fat could adversely affect glucose metabolism and insulin resistance. In dietary practice, exchanging non hydrogenated polyunsaturated fat for saturated and trans-fatty acids could have appreciably had reduced the risk of Type II diabetes. In addition, a low-glycaemic index diet with a higher amount of fibre and minimally processed whole grain products reduced glycaemic and insulinemic responses and lowered the risk of Type II diabetes. Dietary recommendations to prevent Type II diabetes should focus more on the quality of fat and carbohydrate in the diet than quantity alone, in addition to balancing total energy intake with expenditure to avoid overweight and obesity[6]. From the table 4.12 it was observed that the mean energy of the control group 1722.61 ± 229.211 is higher than the mean value of the experimental group 1655.32 ± 277.044 which shows that the energy consumption in the experimental group was much controlled than the control group. Similarly the carbohydrates mean of the control group was 269.71 ± 35.44 which was again on a higher side as compared to the experimental group's mean value of 254.61 ± 52.04. Carbohydrates counting method is generally used for the type 2 diabetics wherein total amount of carbohydrates in each meal is distributed equally to avoid the glycaemic load. And the glycaemic load causes further insulin resistance thus causing much complications. To avoid the carbohydrate loading it is of prime importance to consider the glycaemic index of the foods. Low GI food will help maintain the blood glucose levels. It was evident that the experimental group's mean value is significantly lower than the control group which showed a maintained blood glucose levels. Also the mean of protein 53.82 ± 14.36 was lower than the control group, while the mean value of fats were higher in the experimental group.

Thus it can be concluded that the diet of the experimental group was well maintained and was advantageous as it was low on energy and carbohydrates which will help maintain good glycaemic control.

CONCLUSION

Type-II Diabetes is a multi-factorial disease, it requires more than one line of treatment. The treatment which is cost effective and has hypoglycaemic action also. In India medicinal herbs are of great importance, still it is practiced over several places. The medicinal herbs are easily available and cost effective. In order to test its hypoglycaemic potential this study was conducted. In order to see the efficacy of the leaves a small pilot study was conducted. In the pilot study, 30 subjects were selected using convenient sampling. These 30 were divided into experimental group containing 15 of them and the rest in the control group. In the experimental group, the subjects were further divided into the group of 3. Group 1 were administered with powdered tulsi leaves while group 2 with 5 subjects given powdered curry leaves and the rest of the subjects in group 3 with the combination of powdered tulsi+ Curry leaves. All the three groups were administered at the dosage of 2g/day for 15 days. The control groups was not given any treatment.

The objective of the pilot study was to observe the hypoglycaemic potential of the leaves, according to the result of the pilot study it was observed that the FBG mean of group 1 was 154±46.00 which significantly lower down to 140.4 ± 39.91 while the mean value of the PBG was 212.6 ± 90.237 significantly lowered down to 192 ± 93.66 post supplementation. The Group 2 FBG mean value prior the supplementation was 111.84 ± 23.39 which lowered down to 105 ±18.82 and the PBG mean was 162.34 ±49.533 which declined to 157± 47.82 post supplementation. While the group 3 FBG mean value was 141.2 ± 54.74 pre supplementation while post supplementation it lower down to 136.4 ±56.305 and PBG mean value was 141.4 ± 22.50 which was decreased to 141±23.82 post supplementation. The mean difference of the curry leaves was highest, hence it was selected as the supplement to be given in the main study.

In the main study, 60 subjects were selected. The fresh batch of subjects were selected were to be likely divided into experimental group and control group. The experimental group had 30 subjects which were administered powdered curry leaves 2g/d. While the control group were given no treatment but their blood glucose levels were used for the comparison. In the main study along with the blood glucose levels also the HbA1c levels were monitored. The results of the main study showed that in the experimental group the mean of fasting blood glucose level was 168.846± 33.71 which significantly lowered to 141.55 ± 29.09 post the supplementation of powdered curry leaves of 2g/day for 3 months. It was seen that the post prandial blood glucose levels of the subjects was 159.84 ±56.31 before the supplementation and it increased to 163.51± 45.37 after the supplementation. Also the HbA1c levels of the subjects was analysed it was seen that pre HbA1c levels of the subjects was 6.29 ±1.26 while after the supplementation it was significantly declined considerably to 5.07 ±1.20 which shows the hypoglycaemic potential of the curry leaves.

Since the curry leaves had lowered the FBG levels and HbA1c levels significantly, it can be stated that it has hypoglycaemic potential. Thus it may be concluded that the powdered curry leaves may be used in adjunct to the other treatments with proper lifestyle and diet.

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