

EFFECTIVENESS OF TULSI LEAVES POWDER UPON BLOOD GLUCOSE LEVEL IN DIABETIC PATIENTS

Priyadarshini. R* | Dr. Shobana Gangadharan**

*Balurghat, Dakshin Dinajpur, West Bengal, India.

**Associate professor, College of Health Sciences, University of Buraimi, Oman.

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ABSTRACT

Background and objective: Diabetes is a major health issue that has reached alarming levels. Today, more than half a billion people are living with diabetes worldwide. Without timely diagnosis and adequate treatment, complications and morbidity from diabetes rise exponentially. Clinical researches and reports have shown that the Type 2 diabetes can be managed with healthy eating, regular exercise, oral medications and alternative therapies. In this context, the present study was undertaken to assess the effectiveness of Tulsi leaves powder on blood glucose levels among the Type 2 diabetic patients, as a supporting therapy. **Materials and methods:** Research Approach: Experimental approach; Research Design: Quasi experimental research design; Research setting: Type 2 diabetic patients of different ages and gender, demography and clinical conditions were selected through door-to-door enumeration, mainly residing in ward no-14 of Thiruverkadu Township Area of Tamil Nādu. Patients were divided into Control and Experimental groups (n=30). Crude powder of Tulsi leaves (0.25g/ml) were administered for four weeks. Sampling technique: Purposive sampling technique; Data collection period: 4 weeks. The data was tabulated and analysed by using descriptive and inferential statistics. Hypothesis achieved. **Results:** The results showed that the diabetic patients in the control and experimental groups had mild level of fasting blood glucose (86.67%, 90%) and most of them had moderate level of postprandial blood glucose (73.4%, 80%) before Tulsi leaves powder administration. But there was a significant difference in the experimental group, as all diabetic patients had mild level of fasting blood glucose (100%) and majority of them had mild level of postprandial blood glucose (93.3%) after Tulsi leaves powder administration. Whereas in control group most of the diabetic patients had mild level of fasting blood glucose (83.3%) and moderate level of postprandial blood glucose (83.3%) in the post assessment. In control group there was no significant difference in fasting blood glucose (M=164.7, 169.9 & SD=11.77, 11.24) and postprandial blood glucose (M=231.7, 244.1 & SD=25.40, 23.24) before and after Tulsi leaves powder administration. Whereas experimental group showed a significant difference (p<0.001) in fasting blood glucose (M=169.4, 117 & SD=7.90, 3.91) and postprandial blood glucose (M=239.8, 166.8 & SD=24.34, 19.93) before and after administration of Tulsi leaves powder. **Conclusion:** This study reports the positive effect of Tulsi leaves powder on fasting and post prandial blood glucose levels of Type 2 diabetes patients. This is supported by significant reduction of blood glucose levels in the experimental groups and it implies that Tulsi leaves powder can be used as a supportive therapy for Type 2 diabetes patients.

KEY WORDS: Tulsi Leaves Powder, Diabetes Type 2, Blood Glucose levels.

ABOUT AUTHORS:



Author Priyadarshini. R is from Balurghat, Dakshin Dinajpur, West Bengal, India. She has attended various Seminars and conferences.



Author Dr. Shobana Gangadharan is an active researcher with many publications in her name. At present she is Associate professor, College of Health Sciences, University of Buraimi, Oman.

INTRODUCTION

Diabetes is an "Iceberg" disease. An estimated 537 million adults aged 20–79 years are currently living with diabetes. This represents 10.5% of the world's population in this age group. The total number is predicted to rise to 643 million (11.3%) by 2030 and to 783 million (12.2%) by 2045. An estimated 240 million people are living with undiagnosed diabetes worldwide, meaning almost one-in-two adults with diabetes are unaware they have the condition. Almost 90% of people with undiagnosed diabetes live in low- and middle-income countries. According to WHO annually 1.5 million deaths are reported worldwide due to diabetes. India has an estimated 77 million people (1 in 11 Indians) formally diagnosed with diabetes, which makes it the second most affected in the world, after China. Furthermore, 700,000 Indians died of diabetes, hyperglycemia, kidney disease or other complications of diabetes in 2020. One in six people (17%) in the world with diabetes is from India. (India's population as calculated in October 2018 was about 17.5% of the global total.) The number is projected to grow by 2045 to become 134 million as per the International Diabetes Federation. High prevalence of diabetes is reported in economically and epidemiologically advanced states such as Tamil Nadu and Kerala, where many research institutes which conduct prevalence studies are also present. Traditional treatment applies different herbal principles used as a composite in food, serving as an effective measure against different diseases like diabetes in economically backward rural India lacking in health service infrastructure. One such plant of interest is *Ocimum sanctum* (Lamiaceae), known to the Ayurvedic medical tradition as Tulsi, it has been called the "Queen of Herbs" since the times of ancient civilisation in India. Tulsi acts as anti-diabetic, antimicrobial, hepatoprotective, anti-inflammatory, anti-carcinogenic, radio-protective, immunomodulatory, neuro-protective, cardio-protective, mosquito repellent etc. Although it is native to India, it is now widely grown throughout the world. This herb has been used for centuries in India for cooking, healing, and in worship rituals. In last few decades several studies have been carried out by Indian scientists and researchers to suggest the role of essential oil & *Eugenol* in therapeutic potentials of *Ocimum sanctum*. Eugenol is the major constituent of essential oils extracted from different parts of Tulsi plant. (Rajeshwari S., 1992 and Sen P., 1993). *Ocimum sanctum* leaves help in lowering blood glucose levels and its antioxidant property appears to be predominantly responsible for hypoglycemic effect (Sethi et al., 2004). Plant based control of different diseases can serve as an alternative in the areas where there is difficulty of availability of modern treatment. In large areas of the developing world, numerous plant species are used as folk medicine to Diabetes Mellitus. Many Indian medicinal plants are recommended for the treatment of Type 2 Diabetes Mellitus. *Ocimum sanctum*, commonly known as Tulsi, is one of the plants that have long been used in traditional herbal medicine against diabetes. (Prajapati et al., 2003). Today, with the rise of diabetes in India, many are turning to tulsi (holy basil) to treat this life-altering disease.

In this context, the present study was conducted to analyse the effectiveness of crude powder of Tulsi (*Ocimum sanctum*) leaves on blood glucose levels among Type 2 diabetic patients.

MATERIALS AND METHODS

The present study was conducted in Ward No 14 and Ward No 5 of Thiruverkadu Township of Chennai. The diabetic patients were identified by door to door enumeration and screening. Sixty patients were purposively selected as the study participants, 30 patients as control group in Ward No 5 and 30 patients were selected for experimental group in Ward No 14 of Thiruverkadu Township. The study was primarily concerned to assess the effectiveness of Tulsi leaves powder upon blood glucose level of diabetic patients in the selected wards.

The baseline data of demographic variable and clinical variable were collected before the intervention in both control and experimental groups. The level of fasting and post prandial blood glucose level were assessed on 0 and 28th day for control group and 0, 9th, 18th and 28th day of the intervention for the experimental group. Tulsi leaves powder was prepared by plucking fresh leaves from the plants, dried under the shadow and powdered in mixer. 2.5g of this powder was mixed with 10ml of plain water (Concentration 0.25g/ml) and administered every day orally on empty stomach for four weeks. The diabetic patients in the control group were not administered the powder. The level of satisfaction on Tulsi leaves powder administration was assessed in the experimental group by using rating scale.

Study tool:

The instruments used in this study were demographic variables proforma, clinical variable proforma, blood glucose assessment chart and rating scale on level of satisfaction regarding Tulsi leaves powder administration. Demographic variable proforma includes age, gender, religion, education, marital status, income, occupation, diet, habit of smoking and alcoholism. The researcher collected the data by interviewing the patient.

Clinical variable proforma includes duration of diabetes, family history of diabetes, whether on diabetic medications, on diabetic diet, weight in kilograms, height, body mass index, presence of other comorbidities, physical exercise and whether on any other alternative or complementary therapy. The researcher collected the data by interviewing the patient.

This was used to assess the fasting and post prandial blood glucose levels before and after Tulsi leaves powder administration. The blood glucose levels were categorised.

The rating scale consists of 10 statements on satisfaction of patients regarding Tulsi leaves powder administration upon blood glucose level. The response ranged from highly satisfied, satisfied, dissatisfied and highly dissatisfied.

RESULTS

Significant percentage of diabetic patients were in the age group between 41 to 50 (43.3%, 33.4%), females (53.47%, 46.6%), belonging to Hindu religion (50%, 53.4%), had High school education (30%, 33.4%), occupation as home maker (53.4%, 46.7%), majority of them were married (90%, 93.2%), with monthly income between 5001 to 10,000 (66.7%, 76.6%), non-smokers (66.6%, 80%) and non-alcoholic (70%, 76.6%) and most of them were non-vegetarians (100%, 100%), in control and experimental group respectively.

Significant number of the diabetic patients have been suffering from diabetes mellitus for a duration between 1 to 2 years (36.6%, 53.4%), had body weight between 51-60 kg (46.6%, 43.4.7%), had no family history of diabetes (56.6%, 73.4%), on oral hypoglycemic agents (100%, 100%), not on diabetic diet (40%, 66.6%), with height 156 to 160 cm (46.6, 70%), with BMI between 22.6 to 29.9 (50%, 50%), and majority of them had absence of comorbidities (63.4%, 73.4%), not performing regular exercise (66.6%, 73.4%) and almost all of them were not on other alternative or complementary therapies (100%, 100%).

Majority of the diabetic patients in the control and experimental groups had mild level of fasting blood glucose (86.67%, 90%) and most of them had moderate level of postprandial blood glucose (73.4%, 80%) on the zero day of the study. Whereas in control group most of the diabetic patients had mild level of fasting blood glucose (83.33%) and moderate level of post prandial blood glucose (83.33%). But there was a significant difference in the experimental group; all the diabetic patients had mild level of fasting blood glucose (100%) and majority of them had mild level of postprandial blood glucose (93.3%) after Tulsi leaves powder administration. This could be attributed to the effectiveness of Tulsi leaves powder administration.

In control group the mean and standard deviation of fasting blood glucose in control group is (M=164.7, 169.9 & SD=11.77, 11.24) and post prandial blood glucose is (M=231.7, 244.1 & SD=25.40, 23.24) before and after Tulsi leaves powder administration which is not statistically significant ($p>0.05$), Whereas in experimental group mean and standard deviation of fasting blood glucose (M=169.4, 114 & SD=7.90, 3.91) and post prandial blood glucose (M=239.8, 166.8 & SD=24.34, 19.93) before and after administration of Tulsi leaves powder is statistically significant ($p<0.001$) and it can be attributed to the effectiveness of Tulsi leaves powder administration (Table 1 and 2; Figure 1).

Table – 1 Frequency and Percentage Distribution of Fasting and Post Prandial Blood Glucose Levels of Diabetic Patients in Control and Experimental Groups before and after administration of Tulsi leaves powder

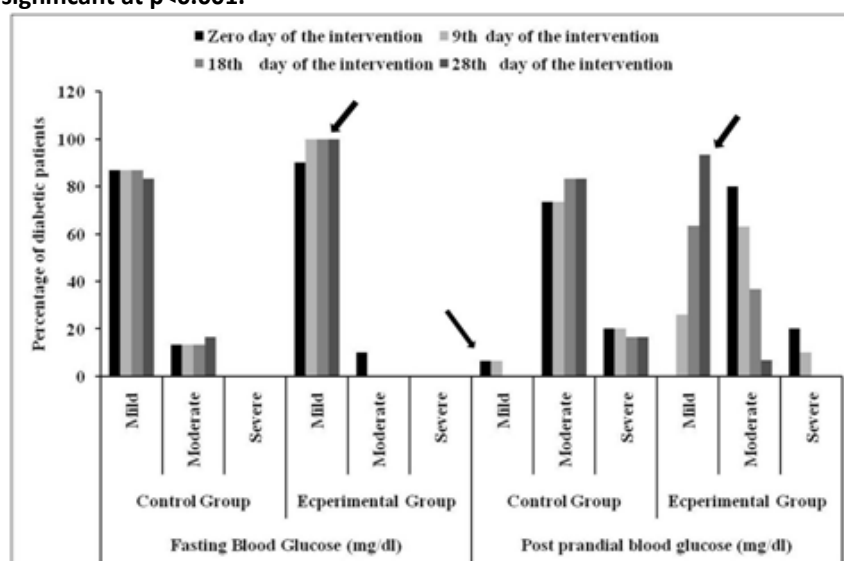
Blood glucose levels		Control Group, (n=30)		Experimental Group, (n=30)	
0 day of the intervention					
		N	P	N	P
Fasting Blood Glucose	Mild	26.00	86.67	27.00	90.00
	Moderate	04.00	13.33	03.00	10.00
	Severe	00.00	00.00	00.00	00.00
Post-prandial Blood Glucose	Mild	02.00	06.60	00.00	00.00
	Moderate	22.00	73.40	24.00	80.00
	Severe	06.00	20.00	06.00	20.00
9 th day of the intervention					
		N	P	N	P
Fasting Blood Glucose	Mild	26.00	86.67	30.00	100.00
	Moderate	04.00	13.33	00.00	00.00
	Severe	00.00	00.00	00.00	00.00
Post Prandial Blood Glucose	Mild	02.00	06.60	08.00	26.66
	Moderate	22.00	73.40	19.00	63.34
	Severe	06.00	20.00	03.00	10.00
N=Frequency (Number of individuals); P=Percentage. Fasting blood glucose level (mg/dl)- Mild (111-180); Moderate (181-250); Severe (>251); Post prandial blood glucose level (mg/dl)- Mild (141-200); Moderate (201-260); Severe (>261). Difference between control and experimental group is significant at p<0.001 as determined by Students “t” test.					
18 th day of the intervention					
		N	P	N	P
Fasting Blood Glucose	Mild	26.00	86.67	30.00	100.00
	Moderate	04.00	13.33	00.00	00.00
	Severe	00.00	00.00	00.00	00.00
Post Prandial Blood Glucose	Mild	00.00	00.00	19.00	63.34
	Moderate	25.00	83.30	11.00	36.66
	Severe	05.00	16.67	00.00	00.00
28 th day of the intervention					
		N	P	N	P
Fasting Blood Glucose	Mild	25.00	83.33	30.00	100.00
	Moderate	05.00	16.67	00.00	00.00
	Severe	00.00	00.00	00.00	00.00
Post Prandial Blood Glucose	Mild	00.00	00.00	28.00	93.33
	Moderate	25.00	83.30	02.00	06.67
	Severe	05.00	16.67	00.00	00.00
N=Frequency (Number of individuals); P=Percentage. Fasting blood glucose level (mg/dl)- Mild (111-180); Moderate (181-250); Severe (>251); Post prandial blood glucose level (mg/dl)- Mild (141-200); Moderate (201-260); Severe (>261). Difference between control and experimental group is significant at p<0.001 as determined by Students “t” test.					

Table – 2: Comparison of Mean and Standard Deviation of Blood Glucose Levels of Diabetic patients between Control and Experimental Group before and after administration of Tulsi leaves powder

Blood Glucose level		Control Group (n=30)		Experimental Group (n=30)		't' Value
		M	SD	M	SD	
Fasting blood glucose	0 day	164.7	11.77	169.4	7.90	1.958
	28 th day	169.9	11.24	114	3.91	26.20
Post-prandial blood glucose	0 day	231.7	25.40	239.8	24.34	1.359
	28 th day	244.1	23.24	166.8	19.93	14.89

M=Mean; SD=Standard Deviation of Mean

Figure – 1: Percentage of type 2 diabetic patients in both the control and experimental groups showing different levels of Fasting and Post-prandial Blood Glucose before and after administration of Tulsi leaves powder. N=30; significant at p<0.001.



DISCUSSION

The current study was conducted to assess the effectiveness of Tulsi leaves powder on the blood glucose levels of Type 2 diabetic patients. Our results suggested that, irrespective of differences in the variables and levels of blood glucose among all the variants/ individuals, there was a significant difference between the fasting and post-prandial blood glucose levels among the control and experimental groups after the direct oral administration of Tulsi leaves powder. All the individuals subjected to this alternate therapy showed mild levels of fasting as well as post-prandial blood glucose levels. The significant drop in their blood glucose level from moderate to mild in the experimental group was statistically justified. The observed difference can be thus attributed to the effectiveness of Tulsi leaves powder administration. Our findings were supported by a study conducted by Riddhi et.al. (2016) which concluded that intake of dried Tulsi leaves powder every day orally on empty stomach could reduce the blood glucose level significantly and may be used as an adjunct with diet and drugs in the management of metabolic syndrome.

It can be concluded that the mild level of blood glucose level can be brought to normal if appropriate measures are taken. Hence all the nurses can be empowered to get trained in alternative therapies and consecutively can practice the same.

RECOMMENDATIONS AND CONCLUSION

- This study shows a possibility of using Tulsi leaves powder for reducing the severity of Type 2 diabetes in patients. This preliminary study can be conducted on a larger population across various geographic locations within the state and outside for validation.
- This study can be used as a base for formulating clinical packages for Type 2 diabetic patients with inclusion of complementary medicines like Tulsi leaf powder.
- This study also gives an idea about the co-relation between the age groups and type 2 diabetes mellitus this is important information to empower nurses and train them to focus on these specific groups for better treatment and awareness.

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