

# Fenugreek Seeds as a Therapeutic Supplement for Patients with Non Insulin Dependent Diabetes Mellitus: A Cross-sectional Study

SHAILENDRA SINGH BHADAURIA<sup>1</sup>, ARCHANA KUSHWAH<sup>2</sup>

## ABSTRACT

**Introduction:** Diabetes mellitus is a metabolic disorder, for which there is no known cure except in very specific situations. Management of diabetes is based on keeping blood sugar levels as close to normal as possible, without causing hypoglycaemia. Usually, this can be accomplished with diet, exercise and use of appropriate medications. In India, herbs are used in treatment to maintain normal blood glucose and lipid levels. In any form of management of diabetes with drug or insulin, diet is a common factor. Besides diet, many plants and foods of medicinal value have proved to be very useful in which one of them is fenugreek seed.

**Aim:** To evaluate the blood glucose modulating effect of Fenugreek Seed Powder (FSP) in patients of Non Insulin Dependent Diabetes Mellitus (NIDDM).

**Materials and Methods:** A cross-sectional study was conducted on 25 patients of NIDDM of age group between 40 to 50 years.

A 5 gm Fenugreek seed powder was given to the patients on empty stomach early in the morning every day. Before beginning the study and at the end of every month, the blood glucose level (fasting and postprandial) was measured consecutively for three months. Statistical Package for Social Sciences (SPSS, version 17.0) computer software package was used for statistical analysis of the data.

**Results:** Administration of FSP lowered the blood glucose levels in patients of NIDDM and a significant reduction in blood glucose level (fasting and postprandial) was observed in the study.

**Conclusion:** Present study suggested that FSP might have potential to modulate blood glucose level which can serve as an effective supportive therapy in the prevention and management of long-term complications of diabetes.

**Keywords:** Fasting blood glucose level, Fenugreek seed powder, Postprandial blood glucose level

## INTRODUCTION

Diabetes mellitus is one of the major metabolic disorders, afflicting a large proportion of the population all over the world. It is recognised for severe complications, which include diabetic nephropathy, neuropathy and retinopathy [1]. Type 2 diabetes may account for 90% to 95% of all diagnosed case of diabetes. Management of diabetes is based on keeping blood sugar levels as close to normal as possible, without causing hypoglycaemia. This can usually be accomplished with diet, exercise and use of appropriate medications [2]. In India, herbs are used in treatment to maintain normal blood glucose and lipid levels [3,4]. In any form of management of diabetes with drug or insulin, diet is a common factor. Besides diet, many plants and foods of medicinal value have proved to be very useful which one of them is fenugreek seed [5,6].

In our country, herbs are used in treatment of diabetes mellitus by many tribes. Plants play several beneficial roles in our life. Plants or herbs not only provide us nutrition but also they have medicinal values. Herbs are being used by about 80% of the world population especially in the developing countries for primary health care [7]. Considering the role of herbs in treatment of diabetes, the present study was undertaken with the aim to assess the impact of fenugreek seeds in modulating blood glucose level of non insulin dependant diabetic patients.

## MATERIALS AND METHODS

This cross-sectional study was conducted between July 2017 to June 2018 at Department of Biochemistry, Government Medical College and Hospital, Banda with all ethical norms (IEC/GMCBANDA/2017/003 Dated 16<sup>th</sup> May, 2017). Twenty five diabetic patients (less than 5 years of duration of NIDDM) who were vegetarian, doing sedentary activity and not taking drugs in the age

group of 40 to 50 years were contacted from Banda city for this study. These patients were included in the study after they gave written informed consent. All participating subjects (vegetarian, not taking any drugs and without any complications of diabetes), who were then explained the study design and purpose of the study.

In this study, FSP was given to the patients with diabetes mellitus and its impact on blood glucose level was observed. The FSP was prepared from fenugreek seeds collected from a shop where herbal preparations were available as suggested by ayurvedic physician. This FSP was used as herbal supplement in the study. Fasting and postprandial blood glucose levels (estimated by Glucose Oxidase-Peroxidase (GOD-POD) method) of the patients were monitored at regular monthly intervals for duration of three months. The initial blood glucose level after an overnight fast (fasting) and postprandial (2 hours after meals) were measured and recorded. A 5 gm FSP was given to the patients on empty stomach early in the morning every day. Before beginning the study and at the end of every month, the blood glucose level (fasting and postprandial) was measured consecutively for three months. Thus blood glucose level (fasting and postprandial) checked four times during study. The patient's personal and family history, physical examinations and blood tests data was collected.

## STATISTICAL ANALYSIS

The results were statistically analysed for logical interpretation of the results. Statistical Package for Social Sciences (SPSS, version 17.0) computer software package was used for statistical analysis of the data.

## RESULTS

Out of total 25 diabetic patients, male were 13 (52%) and female were 12 (48%). [Table/Fig-1] shows the fasting and postprandial

blood glucose level of diabetic patients during three months. The fasting and postprandial blood glucose level after consuming FSP in the first month was 117.72 mg/dL and 152.92 mg/dL, respectively. After 2 months, the fasting and postprandial blood glucose level was 109.04 mg/dL and 157.44 mg/dL. After 3 months, the fasting and postprandial blood glucose level was 94.32 mg/dL and 119.28 mg/dL. The fasting blood glucose level after using FSP was reduced to 94.32 mg/dL from 130.92 mg/dL and postprandial blood glucose level was reduced to 119.28 mg/dL from 172.84 mg/dL.

Duration	Blood glucose levels (mg/dL)			
	Fasting state		Postprandial state	
	Mean	SD	Mean	SD
Initial	130.92	35.13	172.84	46.89
First month	117.72	24.93	152.92	43.37
Second month	109.04	18.41	157.44	42.54
Third month	94.32	14.25	119.28	22.25

**[Table/Fig-1]:** Effect of fenugreek seed powder on blood glucose level.

The data presented in [Table/Fig-2] showed the statistical analysis of effect of FSP on blood glucose level during fasting state. The number of patients was 25 and DF was 48. Table showed the level of significance when initial blood glucose level was compared with blood glucose level after one, two and three months of using FSP during fasting state. The mean±SD of initial blood glucose level was 130.92±35.13. After one, two and three months of using FSP, level of blood glucose was 117.72±24.93 ( $p>0.05$ ), 109.04±18.41 ( $p=0.01$ ) and 94.32±14.25 ( $p<0.01$ ), respectively.

Duration	Blood glucose level (mg/dL)		Number of patients	DF	Significance
	Mean	SD			
Initial vs First month	130.92/117.72	35.13/24.93	25	48	$p>0.05$
Initial vs Second month	130.92/109.04	35.13/18.41	25	48	$p=0.01$
Initial vs Third month	130.92/94.32	35.13/14.25	25	48	$p<0.01$

**[Table/Fig-2]:** Analysis of effect of fenugreek seed powder on blood glucose level during fasting state.  $p$ -value<0.05 considered significant

[Table/Fig-3] showed the statistical analysis of effect of FSP on blood glucose level during postprandial state. Table showed the level of significance when initial blood glucose level was compared with blood glucose level after one, two and three months of using FSP during postprandial state. The mean±SD of initial blood glucose level was 172.84±35.13. After one, two and three months of using FSP, level of blood glucose was 152.92±43.37 ( $p>0.05$ ), 157.44±42.54 ( $p>0.05$ ) and 119.28±22.25 ( $p<0.01$ ), respectively.

Duration	Blood glucose level (mg/dL)		Number of patients	DF	Significance
	Mean	SD			
Initial vs First month	172.84/152.92	35.13/43.37	25	48	$p>0.05$
Initial vs Second month	172.84/157.44	35.13/42.54	25	48	$p>0.05$
Initial vs Third month	172.84/119.28	35.13/22.25	25	48	$p<0.01$

**[Table/Fig-3]:** Analysis of effect of fenugreek seed powder on blood glucose level during postprandial state.

## DISCUSSION

These results [Table/Fig-1] indicate that FSP contains a high percentage of galactomannan which directly or indirectly with other

constituents like 4-hydroxy isoleucine, decreases blood glucose level by stimulation of existing  $\beta$  cells of pancreas [8]. The findings are further supported by a study which links the incorporation of 4.0 gm to 7.0 gm fenugreek seeds in to recipe have a positive effect in controlling blood glucose levels after 3 months of incorporation due to activity [8]. In a study, fenugreek appears to slow down the absorption of sugars in the stomach and stimulate insulin ultimately resulting the decrease in blood sugar level in people with diabetes [6].

In another supporting evidence a study reported that adding 100 grams of defatted fenugreek seed powder to the daily diet of patients with diabetes significantly reduced their fasting blood glucose levels and improved glucose tolerance [6]. Fenugreek has a lowering effect on glycaemic index when added to rice and wheat diets either due to delayed gastric emptying and increased intestinal transit time or by stimulation of  $\beta$ -cells of pancreas [9]. In addition, fenugreek decreases glucose absorption and inhibits starch digestion due to presence of galactomannans and soluble fiber [10]. Adding fenugreek in the diet of diabetic patients 15 minutes before the meal causes a significant reduction in glycaemic index and is beneficial to NIDDM patients for long term control of hyperglycaemia related complications [9-11].

Similarly, observations of this study indicated significant reduction in FBS, PPBS [Table/Fig-2,3] and HbA1c levels after administration of fenugreek seeds in diabetic patients who were vegetarian, nonalcoholic with sedentary lifestyle [12]. A review and meta-analysis suggests that fenugreek seeds may contribute to better glycaemic control in persons with diabetes mellitus with a similar magnitude of effect as intensive lifestyle [13,14]. Fenugreek is widely available at very low cost and generally accepted in diet in resource poor countries such as India where a large proportion of persons with diabetes in the world reside.

The overall changes seen with respect to the hypoglycaemic effect of fenugreek powder could be attributed to the various bioactive phytochemicals present in it. The presence of polyphenols and flavonoids play a major role in activating the insulin release and uptake by its receptors [9]. Further, the reduced absorption due to delayed gastric emptying and antioxidant action might have contributed towards a better glycaemic control over a period of time. Therefore, fenugreek may be a promising complementary option for the clinical management of diabetes mellitus.

## Limitation(s)

NIDDM patients with complications were not included in this study.

## CONCLUSION(S)

In this study, it was concluded that use of FSP lowers the blood glucose level. The regular use of this powder is advocated for diabetics in control of blood glucose levels. Such use of FSP can serve as an effective, supportive therapy in the prevention and management of long term complications of diabetes.

## REFERENCES

- [1] Kumar GS, Shetty AK, Sambaiah K, Salimath PV. Antidiabetic property of fenugreek seed mucilage and spent turmeric in streptozotocin-induced diabetic rats. *Nutrition Research*. 2005;25:1021-28.
- [2] Kaveeshwar SA, Cornwall J. The current state of diabetes mellitus in India. *Australas Med J*. 2014;7(1):45-48.
- [3] Mahan LK, Escott-Stump S. *Food Nutrition and Diet Therapy*. 10<sup>th</sup> ed. USA: WB Saunders Company. 2004.
- [4] Gawer JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. *J Ethnopharmacol*. 2002;81(1):81-100.
- [5] Oubre AY, Calson TJ, King SR, Reaven GM. From plant to patient: An ethno medical approach to the identification of new drugs to the treatment of NIDDM. *Diabetologia*. 1997;40(5):614-17.
- [6] Flammang AM, Cifone MA, Erexson GL, Stankowski LF. Genotoxicity testing of a fenugreek extract. *Food and chemical Toxicology*. 2004;42(11):1769-75.
- [7] Sugandhi R. Antidiabetic plants used by tribal people in India. *Abstract Anarp, Dhaka, Bangladesh*. 2000;3:07-09. <https://www.citeseerx.ist.psu.edu>.
- [8] Rajlakhmi T, Brijlata D, Smita P, Ritu K. Hypoglycemic effect of fenugreek seed flour and soyabean flour on blood glucose levels in selected Noninsulin dependent diabetic patients. *Research Link-23*. 2005;4:25-29. <https://www.healthline.com>type-2diabetes>.

- [9] Vijayakumar MV, Singh S, Chhipa RR, Bhat MK. The hypoglycaemic activity of fenugreek seed extract mediated through the stimulation of an insulin signalling pathway. *Br J Pharmacol*. 2005;146(1):41-48.
- [10] Viyakumar MV, Bhat MK. Hypoglycemic effect of a novel dialysed fenugreek seeds extracts is sustainable and is mediated and is mediated in part by the activation of hepatic enzymes. *Phytother Res*. 2008;22(4):500-05.
- [11] Sampath K, Ramarao J, Ambika DK, Shruti M. Comparative study of fenugreek seeds on glycemic index in high and medium dietary fiber containing diets in NIDDM patients. *NJIRM*. 2011;2(3):11-19.
- [12] Rajesh K, Mukesh M, Meena V, Susmit K, Ravindra K. A prospective study to see the effect of fenugreek seed powder as hypoglycemic agent on type II diabetes mellitus. *International Journal of Bioassays*. 2013;2(10):71-79.
- [13] Wing RR. Long term effects of a lifestyle intervention on weight and cardiovascular risk factors in individuals with type 2 diabetes mellitus. *Arch Intern Med*. 2010;170(17):1566-75.
- [14] Neelakantan N, Narayanan M, de Souza RJ, van Dam RM. Effect of fenugreek (*Trigonella foenum-graecum* L.) intake on glycaemia: A meta-analysis of clinical trials. *Nutr J*. 2014;13:7.

**PARTICULARS OF CONTRIBUTORS:**

1. Associate Professor, Department of Biochemistry, Government Medical College, Banda, Uttar Pradesh, India.
2. Assistant Professor, Department of Nutrition, Government PG College, Beenaganj, Madhya Pradesh, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Shailendra Singh Bhadauria,  
Type 4 Residence, Block 1, Flat No. 3, Medical College Campus,  
Banda, Uttar Pradesh, India.  
E-mail: shailendra\_drsingh@yahoo.co.in

**PLAGIARISM CHECKING METHODS:** [Jan H et al.]

- Plagiarism X-checker: Dec 17, 2020
- Manual Googling: Feb 22, 2021
- iThenticate Software: Mar 23, 2021 (15%)

**ETYMOLOGY:** Author Origin**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Dec 16, 2020**Date of Peer Review: **Jan 23, 2021**Date of Acceptance: **Feb 24, 2021**Date of Publishing: **Apr 01, 2021**