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Antidiabetic effect of fenugreek seeds in selected non-insulin dependent diabetic patients

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Abstract
Diabetes mellitus is a chronic disease and global public health concern, for which there is no known cure except in very specific situations. Management strategies concentrates on keeping blood sugar levels as close to normal as possible, without causing hypoglycemia. This can usually be accomplished with diet, exercise, and use of appropriate medications. In India, herbs are frequently used as traditional medicine for the prevention and treatment of diabetes mellitus but there is scarcity of data to establish the plausible use of fenugreek seeds for the regulation of glucose level in non-insulin dependent diabetic patients. In this study, impact of Fenugreek seeds (*Trigonella foenum graecum*) powder was investigated in selected non-insulin dependent diabetic patients, and it was observed that the use of fenugreek seed powder decreased the blood glucose level. The regular use of this powder advocated for diabetics in control of blood glucose levels. Our results showed that fenugreek seed powder can serve as an effective, supportive therapy in the prevention and management of long-term complication of diabetes. Collectively, impact of fenugreek seeds on glucose regulation, easy accessibility and cost-effectiveness emphasizes on its medicinal use in non-insulin dependent diabetic patients.

Keywords: Diabetes mellitus, fenugreek seeds, fasting blood glucose level, postprandial blood glucose level

Introduction
Diabetes mellitus (DM) is one of the oldest known diseases and has been prominent in the adults (aged between 45 and 64 years) especially in developing countries (Sapra and Bhandari 2021) [16]. According to world health organization (WHO), type 2 DM is a global health concern which leads to increased morbidity and mortality in low and middle-income countries and significantly contributes to the overall disease burden (Goodall *et al*. 2021) [5]. Also, diabetes was the direct cause of 1.5 million deaths and 48% of all deaths due to diabetes occurred before the age of 70 years ((WHO) 2021) [1].
Type 2 DM (non-insulin dependent) is a metabolic disorder associated with insulin resistance and characterized by severe hyperglycemia due to inefficient secretion and functioning of the insulin (Kharroubi and Darwish 2015) [9]. Type 2 DM and insulin resistance is attributable to multiple factors such as obesity, inept dietary intakes and lifestyle habits (Tan *et al*. 2019) [17]. Type 2 DM is also known as non-insulin dependent diabetes mellitus (NIDDM) and 90% of cases can be preventable by following a well-planned regime of healthy diet, exercise and regulation of smoking and alcohol consumption (DeFronzo *et al*. 2015) [3].
The pathophysiology and treatment strategies for Type 2 DM is complex and not fully understood. Although multiple therapeutic interventions and strategies have been documented, majority of anti-diabetic medications are expensive and might impart adverse effects (Marín-Peñalver *et al*. 2016) [11]. Therefore, there is a need to explore and investigate novel anti-diabetic agents which are cost-effective and should not impose adverse effects on the patient's health.
In past few decades, anti-diabetic potential of natural products and medicinal plants has been studied and reported by various research groups (HU and Sun 2017; Pang *et al*. 2019; Unuofin and Lebelo 2020; Kutluay and Diker 2020) [7, 12, 18, 10]. These herbal products might prevent and cure type 2 DM by inhibiting α-glucosidase and α-amylase in the digestive tract, regulating glucose uptake, insulin secretion, proliferation of β-cells and regulating other aspects of and insulin secretion and its mechanism of action (Ríos *et al*. 2015; Unuofin and Lebelo 2020) [15, 18]. Various studies have reported clinical trials of natural products for the treatment of type 2 DM which substantiates the plausible role of herbal and natural products as anti-diabetic agents (Ahmad *et al*. 2021) [2]. These studies included natural products such as Aloe vera,

Panax quinquefolius (American ginseng), Vaccinium myrtillus (Bilberry), Cinnamomum cassia (Cinnamon), Trigonella foenum-graecum (Fenugreek), Allium sativum (Garlic) and so on.

Considering the role of herbs in the treatment of diabetes, we have explored and investigated the role of fenugreek seed (Trigonella foenum-graecum) in modulation of glucose levels in non-insulin diabetic patients from Indian population.

Material and Methods

25 diabetic patients (who were not taking drugs) in the age group of 40-50 years were selected by purposive sampling from medical camp in Hazira area in Gwalior city organized in association with K. R. G. college, Gwalior. Blood samples were collected from the patients with informed consent under the supervision of experienced staff and were sent to a diagnostic lab in Hazira area for glucose analysis. The fenugreek seeds were ground to powder form and this fenugreek seed powder (FSP) was used as an herbal supplement in the study. Fasting and postprandial blood glucose level of the patients was 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) was measured and recorded. 5gm FSP was given to the patient 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) was checked four times during this study. The patient's personal and family history, physical examination and blood tests data was collected. The results were statistically analyzed for logical interpretation of the results.

Results and Discussion

Fenugreek seeds have been widely used in India as a dietary supplement and the antidiabetic potential of FSP has been studied and reported by various research groups (Gong *et al*. 2016) [4]. In India, impact of fenugreek seeds on reduction of glucose levels in diabetic patients has been reported in south Indian population (Pradeep *et al*. 2019) [13] whereas other research groups have shown the role of fenugreek in decreasing glucose levels via suppression of glucose transporters and renin-angiotensin system in diabetic rats (Pradeep and Srinivasan 2018) [14].

In our study, the fasting and postprandial blood glucose level of diabetic patients for three months were recorded (Table-1). The fasting and p.p. blood glucose level after consuming FSP in the first month was 117.72 and 152.92 mg/100ml respectively. After 2 month, the fasting and p.p. blood glucose level was 109.04 and 157.44mg/100ml. After three months, the fasting and p.p. blood glucose level was 94.32 and 119.28 mg/100ml. The fasting blood glucose level after using FSP was reduced to94.32 mg/100ml from 130.92mg/100ml and postprandial blood glucose level was reduced to 119.28mg/100ml from 172.84mg/100ml. These results indicate the FSP decreases blood glucose level. Our findings are further supported by a study which links the incorporation of fenugreek seeds into recipe have a positive effect in controlling blood glucose levels (Kassaian *et al*. 2009) [8].

The statistical analysis of effect of FSP on blood glucose level (fasting) has been summarized in table 2. The number of patients was 25 and D.F. was 48.Table 2 (A) showed the level of significance between initial and after one month (using FSP) blood glucose level (fasting). The mean of initial blood glucose level (fasting) was130.92 and the SD (standard deviation) was ±35.13. After one month (using FSP) the mean blood glucose level was 117.72 and SD was ±24.93.

Table 2 (B) shows the level of significance between initial and after two months (using FSP) blood glucose level (fasting). The mean of initial blood glucose level (fasting) was 130.92 and the SD (standard deviation) was ±35.13. After two months (using FSP) the mean blood glucose level was 109.04 and SD was ±18.41.

Table 2 (C) shows the level of significance between initial and after three months (using FSP) blood glucose level (fasting). The mean of initial blood glucose level (fasting) was130.92 and the SD (standard deviation) was ±35.13. After three months (using FSP) the mean blood glucose level was 94.32 and SD was ±14.25. The level of significance was $p< 0.01$.In supporting evidence a study reported that fenugreek has a lowering effect on glycemic index when added to rice and wheat diets, due to delayed gastric emptying and increased intestinal transit time. In addition, fenugreek decreases glucose absorption and inhibits starch digestion due to presence of soluble fiber and galactomannans. Adding fenugreek to the diet of diabetes patients 15 minutes before the meal causes a significant reduction in glycemic index and is beneficial to NIDDM patients for long term control of their blood glucose levels and prevention of hyperglycemia related complications (Kassaian *et al*. 2009) [8].

The data presented in table 3 (A, B, C) showed the statically analysis of effect of FSP on blood glucose level (postprandial). The number of patient was 25 and D.F. was 48. Table 3 (A) showed the level of significance between initial and after one month (using FSP) blood glucose level (postprandial). The mean of initial blood glucose level (postprandial) was172.84 and the SD (standard deviation) was ±46.89. After one month (using FSP) the mean blood glucose level was 152.92 and SD was ±43.37.

Table 3(B) showed the level of significance between initial and after two months (using FSP) blood glucose level (postprandial). The mean of initial blood glucose level (postprandial) was172.84 and the SD (standard deviation) was ±46.89. After two months (using FSP) the mean blood glucose level was 157.44 and SD was ±42.54.

Table 3(C) showed the level of significance between initial and after three months (using FSP) blood glucose level (postprandial). The mean of initial blood glucose level (postprandial) was 172.84 and the SD (standard deviation) was ±46.89. After three months (using FSP) the mean blood glucose level was 119.28 and SD was ±22.25. The level of significance was $p< 0.01$. Similar observations have been reported by a study which indicated significant reduction in FBS, PPBS and Hba1C levels after administration of Fenugreek seeds in diabetic patients (Kassaian *et al*. 2009) [8].

A review and meta-analysis suggests that fenugreek seeds may contribute to better glycemic control in persons with diabetes mellitus with a similar magnitude of effect as intensive lifestyle (Group and Wing 2010) [6]. Fenugreek is widely available at low cost and generally accepted in resource poor countries such as India where a large proportion of persons with diabetes in the world reside. Therefore, fenugreek might be a promising complementary strategy for the clinical management of diabetes.

Table 1: Effect of fenugreek seed powder on blood glucose level

Duration	Blood glucose level (mg / 100 ml)			
	Fasting		Post prandial	
	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 2: The analysis of effect of fenugreek seeds powder on blood glucose level (fasting) between initial and first month

Period	Blood glucose level		Number of patient	DF	Level of significance
	Mean	Standard deviation			
Initial	130.92	±35.13	25	48	p>0.05
First month	117.72	±24.93	25		

Table 3: Between initial and second month

Period	Blood glucose level		Number of patient	DF	Level of significance
	Mean	Standard deviation			
Initial	130.92	±35.13	25	48	0.01
Second month	109.04	±18.41	25		

Table 4: Between initial and third month

Period	Blood glucose level		Number of patient	DF	Level of significance
	Mean	Standard deviation			
Initial	130.92	±35.13	25	48	*P*< 0.01
Third month	94.32	±14.25	25		

Table 5: The analysis of effect of fenugreek seed powder on blood glucose level (postprandial) between initial value and value after first month

Period	Blood glucose level		Number of patient	DF	Level of significance
	Mean	Standard deviation			
Initial	172.84	±46.89	25	48	P>0.05
First month	152.92	±43.37	25		

Table 6: Between initial value and value after second month

Period	Blood glucose level		Number of patient	DF	Level of significance
	Mean	Standard deviation			
Initial	172.84	±46.89	25	48	p>0.05
Second month	157.44	±42.54	25		

Table 7: Between initial value and value after third month

Period	Blood glucose level		Number of patient	Df	Level of significance
	Mean	Standard deviation			
Initial	172.84	±46.89	25	48	*p*< 0.01
Third month	119.28	±22.25	25		

Conclusion

It has been found from the present study that the use of fenugreek seed powder decreases blood glucose level. The regular use of this powder advocated for diabetics in control of blood glucose levels. Such use of fenugreek seed powder can serve as an effective, supportive therapy in the prevention and management of long-term complication of diabetes. This also proved to be easily available and have less cost.

Ethical statement

Patients sample was collected with informed consent and ethical approval for the sample collection was obtained from KGR College, Gwalior.

Conflict of interest

The author(s) declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

References

1. (WHO) WHO Diabetes, 2021.
2. Ahmad R, Al-Lehaibi LH, AlSuwaidan HN, *et al*. Evaluation of clinical trials for natural products used in diabetes. Medicine (Baltimore). 2021;100:e25641. https://doi.org/10.1097/MD.0000000000025641
3. DeFronzo RA, Ferrannini E, Groop L, *et al*. Type 2 diabetes mellitus. Nat Rev Dis Prim. 2015;1:15019. https://doi.org/10.1038/nrdp.2015.19
4. Gong J, Fang K, Dong H, *et al*. Effect of fenugreek on hyperglycaemia and hyperlipidemia in diabetes and prediabetes: A meta-analysis. J Ethnopharmacology. 2016;194:260-268. https://doi.org/10.1016/j.jep.2016.08.003
5. Goodall R, Alazawi A, Hughes W, *et al*. Trends in type 2 diabetes mellitus disease burden in European Union countries between 1990 and 2019. Sci Rep. 2021;11:15356. https://doi.org/10.1038/s41598-021-94807-z
6. Group LAR, Wing RR. Long-term effects of a lifestyle intervention on weight and cardiovascular risk factors in individuals with type 2 diabetes mellitus: four-year results of the Look AHEAD trial. Arch Intern Med. 2010;170:1566-1575. https://doi.org/10.1001/archinternmed.2010.334
7. HU RF, SUN XB. Design of new traditional Chinese medicine herbal formulae for treatment of type 2 diabetes mellitus based on network pharmacology. Chin J Nat Med. 2017;15:436-441. https://doi.org/10.1016/S1875-5364(17)30065-1
8. Kassaian N, Azadbakht L, Forghani B, Amini M. Effect of Fenugreek Seeds on Blood Glucose and Lipid Profiles in Type 2 Diabetic Patients. Int. J Vitam Nutr Res. 2009;79:34-39. https://doi.org/10.1024/0300-9831.79.1.34
9. Kharroubi AT, Darwish HM. Diabetes mellitus: The epidemic of the century. World J Diabetes. 2015;6:850-67. https://doi.org/10.4239/wjd.v6.i6.850
10. Kutluay VM, Diker NY. Constitution of a comprehensive phytochemical profile and network pharmacology based investigation to decipher molecular mechanisms of Teucrium polium L. in the treatment of type 2 diabetes mellitus. Peer J. 2020;8:e10111. https://doi.org/10.7717/peerj.10111
11. Marín-Peñalver JJ, Martín-Timón I, Sevillano-Collantes C, Cañizo-Gómez FJ del. Update on the treatment of type 2 diabetes mellitus. World J Diabetes. 2016;7:354. https://doi.org/10.4239/wjd.v7.i17.354
12. Pang GM, Li FX, Yan Y, *et al*. Herbal medicine in the treatment of patients with type 2 diabetes mellitus. Chin Med J (Engl). 2019;132:78-85. https://doi.org/10.1097/CM9.0000000000000006
13. Pradeep SR, Barman S, Srinivasan K. Attenuation of diabetic nephropathy by dietary fenugreek (*Trigonella foenum-graecum*) seeds and onion (*Allium cepa*) via suppression of glucose transporters and renin-angiotensin system. Nutrition. 2019;67-68:110543. https://doi.org/10.1016/j.nut.2019.06.024

14. Pradeep SR, Srinivasan K. Alleviation of oxidative stress-mediated nephropathy by dietary fenugreek (*Trigonella foenum-graecum*) seeds and onion (*Allium cepa*) in streptozotocin-induced diabetic rats. Food Funct. 2018;9:134-148. https://doi.org/10.1039/C7FO01044C
15. Ríos J, Francini F, Schinella G. Natural Products for the Treatment of Type 2 Diabetes Mellitus. Planta Med. 2015;81:975-994. https://doi.org/10.1055/s-0035-1546131
16. Sapra A, Bhandari P. Diabetes Mellitus. In: Starpearls [Internet]. Treasure Island (FL): Stat Pearls Publishing. 2021.
17. Tan SY, Mei Wong JL, Sim YJ, *et al*. Type 1 and 2 diabetes mellitus: A review on current treatment approach and gene therapy as potential intervention. Diabetes Metab Syndr Clin Res Rev. 2019;13:364-372. https://doi.org/10.1016/j.dsx.2018.10.008
18. Unuofin JO, Lebelo SL. Antioxidant Effects and Mechanisms of Medicinal Plants and Their Bioactive Compounds for the Prevention and Treatment of Type 2 Diabetes: An Updated Review. Oxid Med Cell Longev. 2020;2020:1-36. https://doi.org/10.1155/2020/1356893.