



ISSN: 2395-7476

IJHS 2023; 9(1): 261-263

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www.homesciencejournal.com

Received: 15-02-2023

Accepted: 21-03-2023

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Effect of fenugreek (Methi dana) on carbohydrate and protein metabolism in diabetic patients

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Abstract

In Country like India, majority of population are vegetarians. So, carbohydrates constitute the main source of calories which in turn causing hyperglycemia and diabetes. To overcome this problem, fibre rich diet plays an important role. Thus, there is a need of suitable material alternative for its treatment as regular use. Therefore, the present study was conducted "The effect of fenugreek (Methi dana) on carbohydrate and lipid metabolism in diabetic patients".

The study was conducted on 15 diabetic patients by feeding them 10 grams of fenugreek powder per day (5 grams twice a day) before meals with warm water for 15 days. The blood samples were taken and analysed for blood glucose and serum cholesterol before and after intake of fenugreek by standard techniques. The fasting blood glucose level was found to be reduced after intake of fenugreek might be due to the enhancement of serum insulin level in diabetic patients as reported by Devi *et al.* (2003). Similarly, serum cholesterol level was also found to be reduced after intake of fenugreek which might be due to the fact that fenugreek powder reduces LDL cholesterol resulting in decreased total serum cholesterol levels as reported by Kadan *et al.* (2013).

Keywords: Methi dana, blood glucose, diabetes

1. Introduction

The word diabetes is derived from the Greek word "diab" (meaning pass through referring to the cycle having thirst and frequent urination) mellitus is the Latin word for "sweeten with honey"(refers to the presence of sugar in urine).

Diabetes mellitus is metabolic disorder of carbohydrate, fat and protein; affecting large number of the population in the world. Diabetes contribute to high rate of morbidity. People with diabetes are at high risk of heart disease, blindness, kidney failure and other chronic conditions. It is not a single disease, but a group of metabolic disorders. It is predicted that the number of diabetics in the world could reach up to 366 millions by the year 2030 (Patel *et al.* 2012) ^[10]. According to The International Diabetes Federation (IDF) in 2013 India alone had 65.1 million people living with diabetes (Neelakantan *et al.*, 2014) ^[9]. An epidemic of diabetes threatens the health of large numbers of individuals in developed and developing countries (Patel *et al.* 2012) ^[10].

Plants are an excellent source of drugs and a large proportion of currently available drugs have been either derived directly or indirectly from the plants. The global incidence of diabetic mellitus is increasing at an alarming rate. There is a need of suitable alternative for its treatment as the regular use. Plant fibres are the portion of plant foods that are not digested in the human small intestine. During the century, remarkable advances have been made in defining the characteristics and importance of most nutrients such as carbohydrate, protein, fat, vitamins and minerals. Plant fibres have largely been neglected because they were considered to have no nutritive values. Evidence are emerging that plant fibres have profound influence on human nutrition because they alter the absorption and metabolism of many nutrients (James *et al.* 1979) ^[4].

The structural fibres make up of plant cell walls include cellulose, lignin, many different hemicellulose and pectin. When carbohydrates and plant fibres are ingested together, less hyperglycemia ensures then when the same amount and type of carbohydrates are ingested without plant fibre. The long term effect of increasing fibre intake on glucose tolerance of normal individuals are not well delineated.

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Some studies suggest that high fibre diet may improve glucose tolerance whereas another study failed to note significant alteration (Wapnick *et al*, 1972) [13].

2. Review of literature

Jenkins *et al.* (1978) [5] have reported an improvement in glucose tolerance when a fibre source was added to the test meal of either healthy or diabetic subjects. Although gums and viscous types of fibres were found to be most effective in glucose tolerance. The removal of fibre from carbohydrate rich foods is also believed to lead to over consumption of food and obesity which is an important factor in causation of diabetes and ischemic heart disease. As the intake of dietary fibre is needed, the apparent availability of other utilisable components of diet is decreased (Southgate and Durmin, 1970) [11]. Patel *et al.* (2012) [10] reported that dietary supplements of fenugreek (Methi dana) modulate the glucose homeostasis and potentially prevent Diabetes mellitus in people with prediabetes. Further they reported that fenugreek caused significant reduction of fasting as well as postprandial glucose levels.

The concentration of serum cholesterol decreased with the high fibre diet. The lowering of serum cholesterol values is probably related to low fat contents associated with high fibre contents of these diets. Soluble fibre has a distinct hypocholesterolemic effect in man.

Gupta *et al.* (2001) [3] reported that the action of fenugreek is mediated by improving insulin sensitivity and decreased insulin resistance in turn reducing glucose absorption. Further they also reported that fenugreek seeds showed hypocholesterolemic effect by reducing LDL cholesterol level. There is a growing global interest in herbal and other form of traditional medicine (Vijay Kumar *et al*, 2005) [12].

Dietary supplements that can modulate glucose homeostasis and potentially improve lipid parameters. Although numerous herbs are reported to possess antidiabetic activity. Fenugreek seeds (*Trigonella foenumgraecum*) are among the best in terms of safety and efficacy (Yadav *et al*, 2008) [14]. Seeds of fenugreek are a rich source of fibre have multiple benefits in patients with diabetes (Kadan *et al*, 2013) [6]. They also reported that fenugreek seeds contain gel like soluble fibre

which combined with bile acids and lower the triglycerides and LDL cholesterol.

Role of fenugreek as an antidiabetic by reducing fasting blood glucose level and improving glucose tolerance in human subjects has been reported by Neelakantan *et al.* (2014) [9]. Fenugreek powder is useful to lower blood sugar in diabetic patients. It might be due to enhancement of serum insulin and mode of action of fenugreek. This hypocholesterolemic effect might be due to their contents of alkaloids as reported by Arpana *et al.* (2015) [1]. Thus scanty and divergent reports are available over the human population regarding the effect of fenugreek seeds powder on carbohydrate and lipid metabolism in diabetic subjects. Therefore, it was thought worthwhile to investigate the effect of fenugreek seeds powder on blood glucose and cholesterol levels in diabetic patients.

3. Material and Methods

The present study was conducted on 15 male diabetic patients aged between 35 to 50 years. They were randomly selected irrespective of their cast and creed. Detailed history was taken to exclude any major illness to affect carbohydrate and lipid metabolism. The subjects having history of drug intake, radiation and any infection during the study were excluded from the present study. The diabetic patients were asked to avoid the intake of any anti - diabetic drugs during this study. These subjects presented themselves for the present study on the basis of personal request, relationship and their eternal eagerness to know the affect of fenugreek (methi dana) on their blood parameters. The subjects were asked to take 10 g of fenugreek powder per day (5g twice a day before meals) with one glass of warm water for 15 days in addition to their routine diet. Each subject acted as its own control. Thus, any changes occurred in blood parameters reflect the effect of fenugreek on these parameters. From each subject 5 ml of fasting blood from antecubital vein was withdrawn before and after 15 days intake as fenugreek powder. The samples were analysed for blood glucose and total cholesterol by semi autoanalyzer using enzymatic kits.

4. Results and Discussion

Table 1: Results of the study are tabulated

S. N.	Blood parameters	Before intake of fenugreek powder (Mean \pm S.D.) mg%	After intake of fenugreek powder (Mean \pm S.D.) mg%	P value
1	Glucose range	217.6 \pm 18.5 196.5 to 239.0	187.4 \pm 13.5 169.3 to 204.6	<0.005
2	Cholesterol range	237.4 \pm 21.6 198.2 to 268.2	195.5 \pm 19.7 184.4 to 210.5	<0.005

It is evident from the table 1 that mean fasting blood glucose level was found to be 217.6 \pm 18.5 with a range of 196.5 to 239.0 mg% in diabetic patients before intake of fenugreek powder. The blood glucose level was found to be reduced to 187.4 \pm 13.5 with a range of 169.3 to 204.6 mg% after 15 days consumption of fenugreek powder 10 g per day before meal. The decrease in blood glucose level as compared to that of control level was statistically significant as shown by p value (<0.005).

The decrease in blood glucose level after fenugreek powder consumption might be due to gelling properties of fibre that retard the digestion of carbohydrates. The undigested carbohydrate may escape into the colon and may be lost in faeces as reported by Leeds *et al.* (1975) [8]. Further, Gupta *et al.* (2001) [3] also reported that the action of fenugreek is

mediated by improving insulin sensitivity and decreasing insulin resistance which in turn reducing blood glucose level.

It is evident from table 1 that mean total serum cholesterol was found to be 237.4 \pm 21.6 with a range of 198.2 to 268.2 mg % in diabetic subjects before consumption of fenugreek powder. It is revealed from table 1 that mean serum cholesterol level was found to be reduced to 195.5 \pm 19.7 with a range of 184.4 to 210.5 mg % in diabetic patients after consumption of 10 g fenugreek powder per day for 15 days. The decrease in serum cholesterol level after consumption of fenugreek powder was statistically significant at 5 percent level as compared to that of before consumption as evident by p value (<0.005). Although serum cholesterol level remained within normal limits but the significant decrease in serum cholesterol level after consumption of fenugreek powder

might be due to the fact that fenugreek powder may bound the cholesterol and retards its absorption resulting decreased serum cholesterol level. It might also be possible that fenugreek powder may cause the depletion of bile acids by fecal excretion, resulting in diversion of cholesterol into bile acid formation and decreased serum cholesterol level as reported by Kay and Transwell (1977) [7]. Furthermore, Kadan *et al.* (2013) [6] reported that fenugreek powder reduces LDL cholesterol resulting in decreased total serum cholesterol.

5. Summary and Conclusions

The importance of dietary fibres to human health has become popular nowadays. It has been reported that inadequate fibre intake and high consumption of processed and refined food could be the cause of high incidence of heart disease, cancer and diabetes. So, the present study "The effect of fenugreek (methi dana) on carbohydrate and lipid metabolism in diabetic patients" was conducted.

- The present study was conducted on 15 diabetic patients
- They were asked to take 10 grams of fenugreek powder per day (5 g twice a day before meal) with a glass of warm water.
- The blood glucose and serum cholesterol were analysed before and after 15 days intake of fenugreek powder.
- The fasting blood glucose and serum cholesterol were analysed by a semi auto analyzer using enzymatic kits.
- The blood glucose level was found to be reduced after intake of fenugreek, might be due to improving insulin sensitivity and decreasing its resistance by fenugreek resulting in decreased blood glucose level.
- The total serum cholesterol level was also found to be reduced after intake of fenugreek powder. The fenugreek reduces the LDL cholesterol level which in turn reduces the total cholesterol.
- Thus, fenugreek powder played an important role in reducing blood glucose as well as total serum cholesterol levels in diabetic patients.

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