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Research Article

**STUDY ON EFFECT OF NIGELLA SATIVA SEEDS AND
FENUGREEK SEEDS IN TYPE 2 DIABETICS**¹Sumaiya Nayeem, ²Mrs. Hannah Jessie Francis.T, ³Dr. Meena Kumari Patangay¹Researcher and Student, Department of Nutrition, St. Ann's College for Women, Hyderabad²Project Guide, Assistant Professor, Department of Nutrition, St. Ann's College for Women,
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Abstract:

The study was carried out to investigate the effect of Nigella sativa and Fenugreek seeds on blood glucose levels in type 2 diabetic patients. The aim of the study is to investigate the effect of Nigella sativa and fenugreek seeds on blood glucose levels in type 2 diabetic patients after one month. The objectives of the study are to know the effect of Nigella and Fenugreek seeds on blood glucose levels and to compare the glucose levels pre and post intervention. In the study 200 type 2 diabetic patients were divided into 2 groups, Nigella sativa group and Fenugreek seeds group. The seeds were given orally in a dose of 2 gm/day and 5 gm/day soaked in hot water respectively for a month. The effect was assessed by measurement of blood glucose levels after one month. Comparison between the two groups showed a significant decrease in blood glucose levels (188.7 ± 20.78 to 150.9 ± 20.26) in Nigella sativa seeds group than in Fenugreek seeds group (169.52 ± 15.4 to 153.74 ± 16.3). It was found that males showed lowered blood glucose levels than females. In conclusion, long term supplementation with Nigella sativa and Fenugreek seeds can be effectively used for improving glucose levels in type 2 diabetic patients with oral hypoglycemic drugs.

Keywords: Diabetes, nigella seeds, fenugreek seeds, blood glucose levels, insulin, hyperglycemia, HbA1c.**Corresponding author:****Sumaiya Nayeem,**

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INTRODUCTION:

The Greek physician Aertaeus coined the term DM (DM). In Greek, diabetes means "to pass through" and mellitus is the Latin word for honey (referring to sweetness). Diabetes is among the leading chronic causes of deaths. Diabetes is a metabolic disease marked by elevated levels of blood glucose levels, which cause serious damage to heart, blood vessels, eyes, kidneys and nerves over time.

CLASSIFICATION:

Diabetes is classified into 4 types:

1. Type 1 Diabetes.
2. Type 2 Diabetes
3. Gestational Diabetes
4. Others

I. Type 1 diabetes: Type 1 diabetes is characterized by deficient insulin production and requires daily administration of insulin in the body. Around 10% of all people with diabetes have been diagnosed with type 1 diabetes. It is caused by an autoimmune reaction where the body's defense system attacks the cells that produce insulin. As a result, the body produces little or no or no insulin. The exact causes of this aren't yet known, but are linked to a mixture of genetic and environmental conditions.

Symptoms:

Some of the common symptoms include: abnormal thirst and dry mouth, sudden weight loss, frequent urination, lack of energy, constant hunger, blurred vision and bedwetting.

II. Type 2 diabetes: Type 2 diabetes is the most common type of diabetes; accounting for around 90% of all diabetic cases. Type 2 diabetes predominantly occurs in older adults, but is also seen in children, adolescents and younger adults because of rising levels of obesity, physical inactivity and poor diet.

Symptoms: The symptoms of type 2 diabetes and include: excessive thirst and dry mouth, frequent urination, lack of energy, slow healing wounds, recurrent infections in the skin, blurred vision, tingling or numbness in hands and feet.

Management of diabetes:

No effective and safe intervention currently prevails to stop type 1 diabetes despite an outsized number of clinical trials aimed towards autoimmune destruction of pancreatic beta cells. A healthy lifestyle that avoids both over-eating and a sedentary lifestyle is suggested for high-risk groups like the siblings of patients with type 1 diabetes.

The preventive measures involve change in lifestyle behaviors and the interventions include:

- Blood sugar control, people with type 2 diabetes are often treated with oral medication, but also can require insulin. If treatment with one medication isn't adequate, combination therapy options are prescribed.
- Foot care (by maintaining foot hygiene, wearing appropriate footwear and regular examination of feet by health professionals).
- Screening for retinopathy and diabetes-related kidney disease. (which causes blindness)
- Blood lipid control (to regulate cholesterol levels)
- A healthy diet includes decreasing the amount of calories if overweight, replacing saturated fats (e.g. cream, cheese, butter) with unsaturated fats (e.g. avocado, nuts and vegetable oils), eating dietary fiber (e.g. fruit, vegetables, whole grains), and avoiding smoking, excessive alcohol and added sugar. Regular physical activity is crucial to help keep blood glucose levels in check including a mixture of both aerobic (eg. jogging, swimming, cycling) exercise and reducing the quantity of your time spent being inactive.

III. Gestational diabetes:

Gestational diabetes is hyperglycemia with blood sugar values above normal but below those diagnostic of diabetes. Gestational diabetes occurs during pregnancy and they are at an increased risk of developing complications during pregnancy and at delivery.

These women and possibly their children are also at increased risk of type 2 diabetes within the long term. Gestational diabetes is diagnosed through prenatal screening.

IV. Impaired glucose tolerance and impaired fasting glycaemia:

Impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG) are the intermediary states in the transition between normality and diabetes. People with IFG or IGT are at high risk of developing type 2 diabetes.

FENUGREEK SEEDS:

Fenugreek (*Trigonella foenum graecum*) is a herb which belongs to the family Leguminosae, widely grown in India, Egypt and Middle Eastern countries (1). These are widely used as a traditional medicine for the treatment of diabetes in Ayurvedic (Indian) medicine (2). They are also used for Chinese and Unani (Arabic) medicine (3). The seeds are rich in protein and contain a free amino acid 4-hydroxisoleicine (4-OH-Ile), which are the active ingredients in fenugreek seeds.

Gupta et al. performed a double blind placebo controlled study in which they administered 1 g/day hydroalcoholic extract of the seeds to 12 patients with T2D for two months and concluded that the use of fenugreek seeds improves glycemic control and reduces insulin resistance in mild type-2 diabetic patients.(4)

Bawadi et.al investigated the postprandial hypoglycaemic effect of fenugreek seeds on 166 T2D patients who were assigned into three groups: FG2.5 (2.5 gm of fenugreek) and FG5 (5gm of fenugreek). Patients were given to drink the extract to drink and were made to chew the seeds. Results revealed that patients in FG5 group showed decrease in postprandial glucose, thus proving a significant hypoglycemic activity in T2D patients. (5)

Ranade M et.al in a study demonstrated the use of fenugreek seed extract addition to daily diet (10 gm of fenugreek seeds soaked in hot water) 60patients with type 2 diabetes. Results indicated a significant reduction in fasting blood glucose levels after the fifth month of treatment. (6)

NIGELLA SEEDS:

Nigella sativa is an annual plant of the botanical family Ranunculaceae and grows in Europe, Middle East and Western Asia. *Nigella sativa* is known as black cumin and is used as a traditional medicine in Arabian countries and Indian sub-continent. It is also used for treating a wide range of illnesses including infections, back pain, hypertension and gastrointestinal problems bronchial asthma. A study revealed the anti diabetic effect of *Nigella sativa* was due to its insulinotropic action (7) and the antioxidant properties decreased the oxidative stress and maintain pancreatic β -cell integrity (8). The glycemic control of *Nigella sativa* was attributed to its extra pancreatic actions and the inhibition of hepatic gluconeogenesis. (9)

In a study conducted on 94 T2D patients, *Nigella* seeds (1, 2 or 3 g/day) were included in anti diabetic drugs. After 3 months, a significant decrease was observed in FBG, PPBG and HbA1c levels indicating as a beneficial adjuvant to oral hypoglycemic agents in type 2 diabetic patients. (10)

Kaatabi H et.al reported the anti diabetic activity upon three-month supplementation of *N. sativa* (2 g/day) along with oral anti diabetic agent in 114 type 2 DM patients.. In this study, *N. sativa* group showed

significant reduction of fasting plasma glucose, hemoglobin A1c.(11)

Ahmed MM et.al evaluated the effect of black seeds in 66 subjects. First group included 41 patients with T2DM and the second group included 25 apparently healthy volunteers. The patients were chosen to be free of diabetic complications. All subjects received *N. sativa* tea (5gm/day) for 6 months in addition to oral anti diabetic drugs. Results showed *N. sativa* tea improved the glycemic control and lipid profile and increased PON-1 activity in T2DM. (12)

MATERIALS AND METHODS:

The study was conducted on Type 2 diabetic patients (male and female) aged 30-60 years. The sample size was 200. The study was divided into 2 groups; *Nigella sativa* seeds group (n=100) and Fenugreek seeds group (n=100). Each of these groups were further subdivided into experimental group (n=50) and control group (n=50).

EXPERIMENTAL GROUP: 100 type 2 diabetic patients (28 males and 72 females) voluntarily participated in the study. None of them were suffering from any major medical or psychiatric illness. For the intervention, a WhatsApp group was created. Before the intervention the subjects were asked to measure their blood glucose levels using a glucometer and the values were recorded. 50 subjects of the *Nigella sativa* seeds group were asked to consume 2 grams of *Nigella sativa* seeds before breakfast and 50 subjects of the Fenugreek seeds group were asked to consume 5 grams of Fenugreek seeds soaked in hot water every day for one month. After a period of one month, the subjects were asked to measure their blood glucose levels and the values were recorded. Information regarding the procedure and objectives of the study was given in the consent form and explained to the participants. Additionally the patients of both groups continued with their medications as prescribed by their doctor.

CONTROL GROUP :The control group (n=100) (50 from *Nigella sativa* seeds group and 50 from Fenugreek seeds group) were asked not to take any other nutritional or herbal supplement.

The subjects were included in the study based on the following criteria :

Table 1.1 showing the inclusion and exclusion criteria

S.No	INCLUSION CRITERIA	EXCLUSION CRITERIA
1.	30-60 years old (male /female) with type 2 Diabetes	80+ years old male/female with any other type of diabetes or diabetic complications
2.	Without chronic diseases (in the liver, kidney, muscular and nervous system or others)	Smokers, drinkers and people with comorbidities (Hypertension, hyperlipidemia, obesity, chronic kidney diseases)
3.	Without pregnancy and lactation	The entrance of female to pregnancy or lactation during the study
4.	1-10 years of diabetic history	Patients who are not willing to participate in the study and unable to give informed consent

STATISTICAL ANALYSIS: Statistical analysis was performed using Microsoft Excel. The analysis was done using paired t-test. The level of significance was ($p < 0.05$) As the p-value is significantly less than the alpha ($p < 0.05$) we can reject the null hypothesis. Data was presented as mean \pm standard error of the mean (SEM). A probability of $P < 0.05$ was considered significant.

Table 1.2 showing mean \pm SD of blood glucose levels before and after intervention in both groups.

S.No	FASTING BLOOD GLUCOSE LEVELS (mg/dl)	
	PRE INTERVENTION	POST INTERVENTION
1. Nigella sativa seeds group	185.4 \pm 16.96	156.6 \pm 20.45
2. Fenugreek seeds group	169.52 \pm 15.46	152.46 \pm 16.76

Table 1.3 showing mean \pm SD of blood glucose levels before and after intervention in both groups in Females.

S.No	FASTING BLOOD GLUCOSE LEVELS (mg/dl)	
	PRE INTERVENTION	POST INTERVENTION
1. Nigella sativa seeds group	181.8 \pm 15.96	160.2 \pm 20.93
2. Fenugreek seeds group	170 \pm 18.13	155.7 \pm 19.26

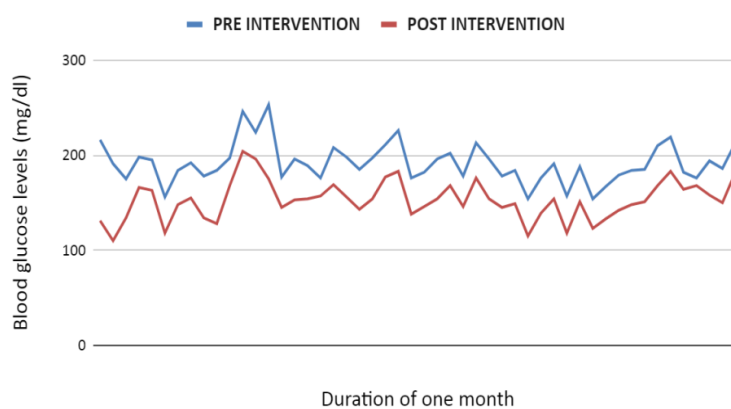
Table 1.4 showing mean \pm SD of blood glucose levels before and after intervention in both groups in Males.

S.No	FASTING BLOOD GLUCOSE LEVELS (mg/dl)	
	PRE INTERVENTION	POST INTERVENTION
1. Nigella sativa seeds group	194.79 \pm 15.67	152.75 \pm 19.60
2. Fenugreek seeds group	169.0 \pm 11.97	148.7 \pm 12.65

RESULTS:

After a period of one month, the blood glucose levels of type 2 diabetic patients were assessed again to investigate the effect of Nigella sativa seeds and Fenugreek seeds. The results of the study revealed reduction in blood glucose levels was found to be more in the Nigella sativa group (2gm/day). The Fenugreek seeds (5gm/day) group showed a slightly lower reduction compared to the nigella sativa group. No adverse side effects were reported by participants during the study period.

Pre and post intervention effect of Nigella seeds on blood glucose levels

**Fig 1.1** Changes in fasting blood glucose levels after 1 month in type 2 diabetics after using Nigella sativa seeds

Patients of Nigella sativa seeds group, treated with 2 g/day Nigella Sativa, showed significant changes as seen in the graph. The mean blood glucose levels observed pre intervention and post intervention in Nigella Sativa group were 188.7 ± 20.78 and 150.9 ± 20.26 respectively.

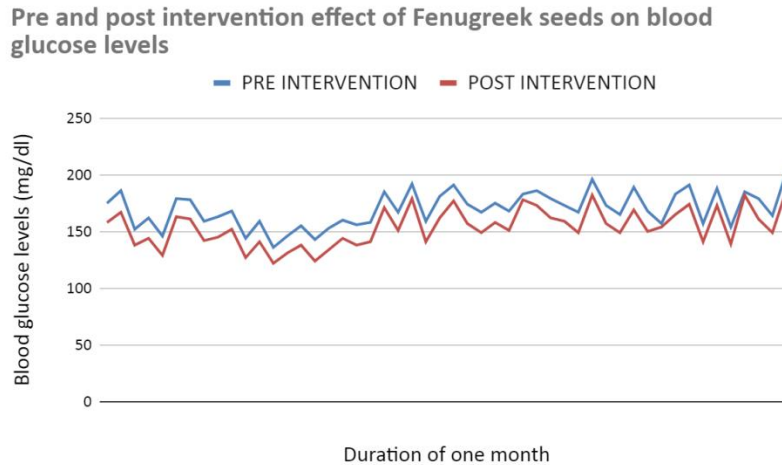


Fig 1.2 Changes in fasting blood glucose levels after 1 month in type 2 diabetics after using fenugreek seeds

Patients of the Fenugreek seeds group, treated with 5 g/day also showed significant changes as seen in the graph. The mean blood glucose levels observed pre intervention and post intervention in the fenugreek group were 169.52 ± 15.4 and 153.74 ± 16.3 respectively.

Effect of Nigella sativa seeds on Blood glucose levels in Females

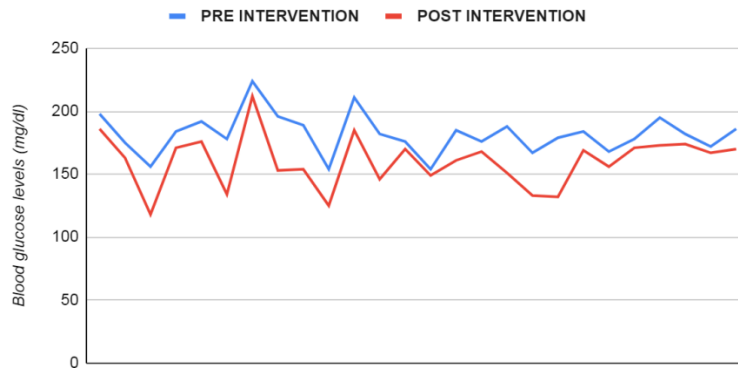


Fig 1.3 Changes in fasting blood glucose levels after 1 month in type 2 diabetics after using Nigella sativa seeds in Females

Female patients of Nigella sativa seeds group, treated with 2 g/day Nigella Sativa, showed significant changes as seen in the graph. The mean blood glucose levels observed pre intervention and post intervention in Nigella Sativa group were (181.8 ± 15.96) and (160.3 ± 20.93) respectively.

Effect of Nigella sativa seeds on Blood glucose levels in Males

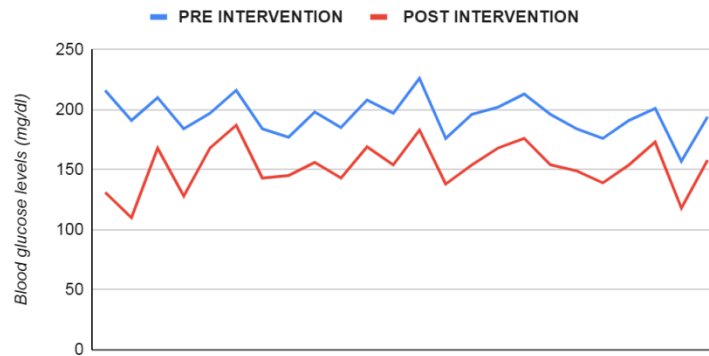


Fig 1.4 Changes in fasting blood glucose levels after 1 month in type 2 diabetics after using Nigella sativa seeds in Males

Male patients of Nigella sativa seeds group, treated with 2 g/day Nigella Sativa, showed significant changes as seen in the graph. The mean blood glucose levels observed pre intervention and post intervention in Nigella Sativa group were (194.79 ± 15.67) and (152.75 ± 19.60) respectively.

Effect of Fenugreek seeds on Blood glucose levels in Females

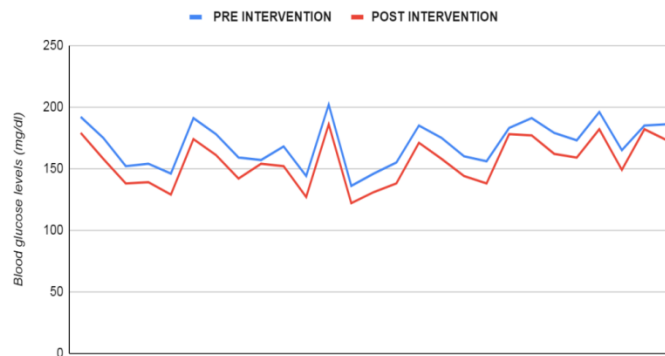


Fig 1.5 Changes in fasting blood glucose levels after 1 month in type 2 diabetics after using Fenugreek seeds in Females

Female patients of the Fenugreek seeds group, treated with 5 g/day also showed significant changes as seen in the graph. The mean blood glucose levels observed pre intervention and post intervention in the fenugreek group were (170.0 ± 18.13) and (155.7 ± 19.26) respectively.

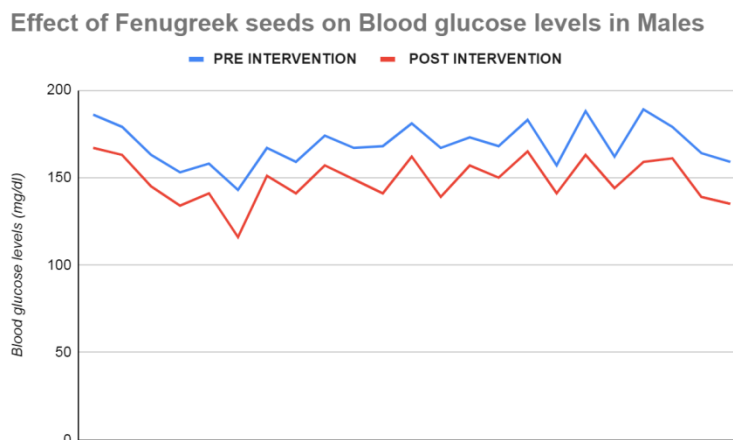


Fig 5.1.6 Changes in fasting blood glucose levels after 1 month in type 2 diabetics after using Fenugreek seeds in Males

Male patients of the Fenugreek seeds group, treated with 5 g/day also showed significant changes as seen in the graph. The mean blood glucose levels observed pre intervention and post intervention in the fenugreek group were (169.0 ± 11.97) and (148.7 ± 12.65) respectively.

DISCUSSION:

From the statistical analysis, we can say that the blood glucose levels of the Nigella sativa seed group were lower when compared to fenugreek seeds group. Hence in this study the nigella sativa seeds supplementation for one month was more effective in lowering blood glucose levels in type 2 diabetes. As the study demonstrated a decrease in blood glucose levels, the glycemic control can be achieved by combination of both nigella sativa seeds and fenugreek seeds.

From the statistical analysis, it was found that males responded well to the intervention given in both groups compared to females.

In a study conducted in type 2 diabetic patients (male and female) it was found that men (32.4%) reached the therapeutic goal of $<7.0\%$ for glycosylated hemoglobin than women (26.9%) and the study concluded that women were in need of an aggressive treatment as their cardiovascular and blood pressures levels were higher compared to men. (13)

Further research and evidence of human subjects are needed to prove the effectiveness and safety of using

nigella sativa seeds and fenugreek seeds as an adjuvant to oral hypoglycemic drugs and also to provide accurate information to the population.

CONCLUSION:

The results of the study clearly indicate a potential protective effect and revealed a hypoglycemic effect on usage of both Nigella sativa seeds and fenugreek seeds. However, the effect of Nigella sativa seeds on fasting blood glucose was visible within the first week of treatment while in the fenugreek seeds group the blood glucose levels reduction were seen after 10 days of the intervention. Side effects on usage of nigella seeds were not observed. As Nigella Sativa seeds showed a higher decrease in fasting blood glucose levels than fenugreek seeds and it is also a low cost herb so Nigella Sativa seeds can be used as natural adjuvant to oral hypoglycemic drugs in the management of type 2 diabetics or it can be used concurrently with diet and exercise. In conclusion, administration of 2 g/day Nigella Sativa seeds may be effective in lowering fasting blood glucose levels and the period of administration of fenugreek seeds should be increased to observe the decrease in fasting blood glucose levels.

LIST OF ABBREVIATIONS

Abbreviation	Description
DM	Diabetes mellitus
T2DM	Type 2 Diabetes mellitus
HbA1c	Hemoglobin A1c
FBG	Fasting blood glucose
PPBG	Postprandial Blood Glucose
mg/dl	milligram per deciliter
HDL	High density lipoprotein
LDL	Low-density lipoprotein
VLDL	Very-low-density lipoprotein
N.sativa	Nigella sativa
T.foenum	Trigonellafoenum
TC	Total cholesterol
TG	Triglycerides
STD DEV	Standard deviation
BMI	Body mass index

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