Original Article

Effectiveness of Fenugreek Seed Powder (Trigonella Foenum- Graceum) As Adjuvant Therapy Among Prediabetic Hospital Employees In Kerala, India.

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Abstract

Introduction: Prediabetes is a lifestyle disease and dietary modifications are effective for its management and prevention. Prediabetes is a greater risk factor for type 2 diabetes mellitus, cardiovascular disease, renal failure and stroke, and is one of the most critical issues regarding human health. There are economic reasons for the above statistics. Healthcare professionals play a crucial role in developing innovative strategies to safeguard public health. Integrating evidence-based traditional home remedies into dietary practices may support the maintenance of blood glucose levels within the normal range.

Methodology: A quantitative approach with Pre Experimental one group Pretest- Post-test design was adopted for this study. One hundred hospital employees with Prediabetes who were aged between 25-65 years were selected for the study by Convenience Sampling Technique. Data were collected and analyzed by Descriptive and Inferential statistics.

Conclusion: The present study indicating that the fenugreek seed was effective on reducing the blood sugar level in Prediabetes hospital employees. The study recommends strongly to consumptions of fenugreek seed as a cost effective management of Prediabetes in all healthcare setting and community. With this regard, the researcher would like to suggest to take more number of adjuvant therapies to treat lifestyle diseases for the wellbeing of society which would turn in to better outcome.

Key words: Fenugreek seed, Prediabetes, Trigonella Foenum – Graceum, Adjuvant Therapy

Introduction

Diabetes is a major global health concern which has emerged as a serious metabolic disorder and a growing life-threatening condition. The burden of diabetes has been steadily rising over the past few decades worldwide, including in India[1.] It is well established that diabetes reduces life expectancy, increases mortality rates, and predisposes individuals to acute metabolic complications. Insulin plays a

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vital role in facilitating the entry of glucose from the bloodstream into body cells, thereby providing essential energy for cellular function. A defect in insulin secretion, insulin action, or both disrupts the normal metabolism of carbohydrates, fats, and proteins, ultimately leading to the development of diabetes-related complications[4]. According to **World Health Organization (2022)** published data shows that in 2016, an estimated 1.6 million deaths were directly related to diabetes and all deaths occur before the age of 70 yrs. Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use are the ways to prevent or delay the onset of full blown diabetes mellitus. With the capital rise of diabetes and premature death, the National Health Policy of India in 2017 increases the screening programmes and treatment for up to 80% of people with diabetics and aims to reduce premature deaths that are occurring from diabetes by 25% within 2025[11].**Diabetics organization report (2021)** focus that Diabetes is the major cause for morbidity and mortality among people, especially in developing countries like India. In India different states have variable trends in prevalence of diabetes. Among the states, Kerala is considered as the "Diabetic Capital" of India with the highest prevalence of 19.4% of diabetes. In Kerala, Pathanamthitta, Malappuram and Kozhikode district were identified as the major chronic state of diabetes among population[7].

Before the occurrence of full blown disease of diabetes, Individuals enters a prior state called "Prediabetes" when a person has pre diabetes, their body cannot use insulin effectively. The term **"Prediabetes"** is introduced by American diabetes association in 2002 as a state between normal blood sugar and type 2 diabetes[14]. Pre diabetes is one of the leading risk factor for type 2 diabetes with a warning alarm to the life. It is also a sign that determines the disturbances in the metabolic process of the body. Pre diabetes is a pre-diagnosis of diabetes[3]. It is the prior stage before diabetes mellitus in which not all symptoms required to diagnose diabetes and the blood sugar level ranges between 120 and 140 mg/dl. This stage is often referred to as the "grey area".

Prediabetes is a condition where blood sugar levels are higher than normal but not yet high enough to be called type 2 diabetes. It is a warning stage that can still be reversed with proper lifestyle changes. Without treatment, about 70% of people with prediabetes eventually develop type 2 diabetes (International Diabetes Federation, 2023)[7]. India has one of the highest rates of diabetes in the world, and Kerala shows especially high numbers due to sedentary habits and unhealthy diets (Mohan et al., 2020)[32]. Hospital employees are also at risk because of irregular work shifts and stress. This makes healthy lifestyle changes, particularly in diet, very important for prevention[17].

Fenugreek (Trigonella foenum-graecum), a common herb used in Indian cooking, is known for its health benefits. It contains soluble fiber, saponins, and 4-hydroxyisoleucine—natural compounds that help increase insulin release and slow down sugar absorption in the body (Kumar et al., 2022). This study aimed to find out how effective fenugreek seed powder could be as an additional therapy to help lower blood sugar levels in prediabetic hospital employees in Kerala[26].

Materials and Methods

The research methodology involved a six-month data collection period at Chitra Multispecialty Hospital and Lifeline Multispecialty Hospital in Pathanamthitta District, Kerala, following the receipt of formal written permission from the respective medical superintendents. The purpose of the study was explained to hospital employees clearly, and informed consent was obtained individually from those identified as prediabetic.

Screening for prediabetes was conducted by assessing blood glucose levels over a 10-day period, with a minimum of three readings considered for classification. Individuals with fasting blood glucose levels between 100–125 mg/dL were categorized as prediabetic. Data collection was carried out on all days of the week during daytime hours. A convenience sampling technique was used to recruit participants, and a pre-experimental one-group pretest–posttest design was employed.

The sample size was limited to 100 participants, reflecting the focus on hospital employees and the practicality of assessing their health status. Power analysis was conducted to ensure adequate statistical

strength and to enhance the likelihood of detecting true effects, thereby strengthening the study's validity.

Inclusion Criteria

- Hospital Employees who were available during the time of data collection.
- Hospital employees who are willing to participate in the study.
- Hospital Employees those who were age above 25 years and below 65 years.
- A employee whose blood sugar level was between 100 -125mg/dl
- Hospital Employees who were both males and females.
- Hospital Employees who were regularly working in the setting.
- Hospital Employees who were able to read and write English and Malayalam.

Exclusion Criteria:

- Prediabetic hospital employees who refused to participate in this study.
- Hospital Employees with complications like Hormonal disorder and seriously having Gastric trouble towards fenugreek.
- Employees who were pregnant and lactating mothers.

The total sample size was limited to 100 participants, as the study focused exclusively on hospital employees, allowing for convenient access and reliable assessment of their health status. Sample size was determined using a intial power analysis for a paired t-test, assuming an expected mean reduction of 10 mg/dL in fasting blood glucose, a standard deviation of 25 mg/dL, a two-tailed α of 0.05, and 80% power. The calculated sample size was 97; therefore, a total of 100 participants were recruited to account for potential attrition. Individuals with fasting blood glucose levels between 100–125 mg/dL were classified as prediabetic. Screening was conducted over a 10-day period, during which a minimum of three fasting blood glucose readings on separate days was required to confirm eligibility.

Eligible participants were instructed to consume 15 grams of fenugreek powder mixed with warm water every morning before breakfast for a period of three months. After consuming the fenugreek powder, participants were instructed to refrain from eating for one hour. Adherence to this routine throughout the intervention period contributed to a progressive reduction in blood glucose levels, demonstrating the effectiveness of the regimen. Data collection was carried out continuously throughout the intervention. Following completion of the intervention, post-intervention blood pressure levels were assessed using standard clinical parameters. Ethical approval for the study was obtained from the Institutional Human Ethics Committee (Project No. CCON 11/007/2018, dated 09/08/2018)

Statistical analysis

Statistical analysis was performed using Statistical Package for Social Science (SPSS)/PC, Version 20. The data analysis plan comprised descriptive analysis, where frequency and percentage distributions were computed to examine demographic variables. Mean and standard deviation calculations were employed to analyze the pre- and post-test levels of mental health characteristics. Significance levels were set at $p < .001$ for high significance and $p < 0.01$ for significance. Inferential statistics utilized a paired t-test to compare pre- and post-levels of prediabetes. An unpaired t-test was applied to evaluate prediabetes levels between the control and intervention groups. Additionally, a post-hoc Scheffe test was conducted for multiple comparisons of clinical variables in the intervention group post-test, with statistical significance set at $p < 0.01$.

Results

Sample characteristics. N = 100

S.NO	DEMOGRAPHIC VARIABLE	FREQUENCY	PERCENTAGE
1	Identification of Data		
	1. Age (years)	20	20
	a. 25-35	38	38
	b. 36-45	27	27
	c. 46-55	15	15
	d. 56-65		
2	Gender		
	a) Male	30	30
	b) Female	70	70
3	Marital status		
	a. Married	51	51
	b. Unmarried	28	28
	c. Widow / Widower	12	12
	d. Separated	9	9
4	Religion		
	a. Hindu	57	57
	b. Muslim	25	25
	c. Christian	18	18
5	Type of family		
	a. Nuclear Family	53	53
	b. Joint family	41	41
	c. Extended family	6	6
6.	Educational status		
	a. Primary	16	16
	b. Secondary	27	27
	c. Higher Secondary	21	21
	d. Collegiate	36	36
7	Occupational status		
	a. RegularEmployee	48	48
	b. Contract Employee	52	52
8.	Type of work		
	a. Sedentary Work	26	26
	b. Moderatework	41	41
	c. Heavy work	33	33

9.	Monthly income		
	a. BelowRs.1000	35	35
	b. Rs.10001 – Rs.20000	39	39
	c. Rs.20001-Rs.30000	18	18
	d. above Rs.30001	8	8
10	Dietary pattern		
	a. Vegetarian	26	26
	b. Non vegetarian	74	74
11.	Practice of exercise		
	a) Routine	20	20
	b) Not Routinely	80	80
12	Smoking status		
	a) Active	21	21
	b) Passive	13	13
	c) No Smoking	66	66
13	Alcohol consumption		
	a) Yes	31	31
	b) No	69	69
14	History of Hyper cholesterol		
	a) Yes	35	35
	b) No	65	65
15	History of Hypertension		
	a) Yes	68	68
	b) No	32	32
16	Family history of Diabetes Mellitus		
	a) Yes	61	61
	b) No	39	39
17	Body Mass Index		
	a) Underweight (below 8.5)	0	0
	b) Healthy weight (18.5-24.9)	64	64
	c) Over weight (25.0-29.9)	36	36
	d) Obesity (30.0 and above)	0	0
18	Waist Circumference		
	a) Low risk(M-80-99 cm, F- 70-89cm)	73	73
	b) High risk(M- 100-120 cm, F-90-110 cm)	26	26
	c) Very high risk(M- Above 120cm, F- Above110cm)	01	01

Overall among the sample100 participants, the majority (38%) were between 36–45 years of age, and mostly were females (70%). More than half (51%) were married, and the predominant religion was Hinduism (57%). Most participants belonged to nuclear families (53%) and had collegiate education (36%). Employment status was almost evenly split between regular (48%) and contract (52%) employees, with most engaged in moderate (41%) or heavy (33%) work. The majority (74%) earned below ₹20,000 per month and followed a non-vegetarian diet (74%). Only 20% reported exercising routinely. Most participants were non-smokers (66%), while 31% consumed alcohol. A significant proportion had a history of hypercholesterolemia (35%) and hypertension (68%), and 61% reported a family history of diabetes. Based on BMI, 64% were within a healthy range and 36% were overweight. Regarding waist circumference, 73% were categorized as low risk and 26% as high risk.

Assessment of the Effectiveness of Adjuvant Therapy on Fenugreek Seed Powder Among Prediabetes Hospital Employees.

Sl.No	Clinical Profiles	Pretest		Posttest		t test	P value
		Mean	SD	Mean	SD		
1	Body weight	69.36	0.6	65.01	0.6	4.9947	<0.05
2	BMI	24.59	0.2	22.99	0.2	6.6341	<0.05
3	Waist Circumference	86.95	1.1	82.26	1.0	3.1410	<0.05
4	Glucose Profile						
	a. HbA1C	5.84	0.0	5.35	0.0	19.8691	<0.05
	b. FBS	117.75	0.8	95.18	0.6	22.2144	<0.05
	c. Oral Glucose Tolerance	165.98	1.6	139.14	1.5	11.8840	<0.05
5	Lipid Profile						
	a. Total Cholesterol	229.33	1.6	196.86	2.3	11.6276	<0.05
	b. Triglycerides	179.50	2.6	153.84	2.1	7.6298	<0.05
	c. HDL	41.85	0.7	61.80	1.5	11.9999	<0.05
	d. LDL	168.09	2.0	142.07	2.1	8.8442	<0.05

The table shows the pretest and the posttest mean of the clinical parameters of blood sugar level among prediabetic hospital employees. The table shows that there is mean reduction in all the clinical profiles after the administration of the fenugreek seed powder. The mean difference in Body weight is 4.35, BMI is 1.6, Waist Circumference is 4.68 HbA1C is 0.49, FBS is 23, Oral Glucose Tolerance is 26.84, Total Cholesterol level is 32.47, Triglycerides is 25.66 and LDL is 26.2. There is an increased mean for HDL of 19.95. The difference was statistically significant at $P < 0.05$.this shows that fenugreek seed powder administration had significant reduction in the clinical profiles hence the research hypothesis H1 is accepted.

Discussion

The findings of this study indicate that the daily intake of fenugreek seed powder produced a statistically significant improvement in both glycemic control and lipid profile parameters among prediabetic hospital employees. The hypoglycemic effect of fenugreek can be attributed to its rich soluble fiber content, particularly galactomannan, which slows gastric emptying and reduces intestinal glucose absorption, thereby preventing postprandial hyperglycemia. Additionally, the presence of 4-hydroxyisoleucine, an amino acid unique to fenugreek, plays a crucial role in stimulating pancreatic insulin secretion and enhancing peripheral glucose utilization, contributing to improved glucose homeostasis (Patwardhan et al., 2019)[28.24]. Moreover, the observed increase in HDL cholesterol and the decrease in LDL cholesterol and triglyceride levels suggest potential cardio protective effects, consistent with the findings of Khan et al. (2021). These improvements not only indicate better metabolic regulation but also a reduced risk of cardiovascular complications, which are commonly associated with prediabetes and metabolic syndrome.

Importantly, the intervention was cost-effective, safe, and well-tolerated by participants, with no reported adverse effects. Given its accessibility and ease of administration, fenugreek seed powder can be recommended as an effective adjunct to lifestyle modification programs**.** This makes it a feasible option for large-scale community-based and workplace wellness initiatives aimed at preventing the progression from prediabetes to type 2 diabetes mellitus[29,11,14].

Results revealed that there was a significant decrease in clinical parameters which were found to be above normal such as Body weight, BMI, waist circumference, HbA_1C, FBG, OGT, total cholesterol, triglyceride, HDL and LDL. The mean difference in Body weight is 4.35, BMI is 1.6, Waist Circumference is 4.69 HbA1C is 0.48, FBS is 23, Oral Glucose Tolerance is 26.84, Total Cholesterol level is 32.47, Triglycerides is 25.66 and LDL is 26.2. There is an increased mean for HDL of 19.95. The difference was statistically significant at $P < 0.05$. This shows that fenugreek seed powder administration had significant reduction in the clinical profiles hence the research hypothesis H1 is accepted. Zaw et al. (2021) conducted a national survey in Myanmar to assess the prevalence and risk factors of diabetes and prediabetes. Using multistage proportional cluster sampling, 8,575 participants from 52 townships were included. Ethical approval was obtained from the Department of Medical Research (Lower Myanmar). Fasting plasma glucose and a 2-hour OGTT were used for diagnosis, along with interviews on lifestyle and anthropometric measurements. Data were analyzed using STATA version 13 with multinomial logistic regression. The study found a 10.8% prevalence of diabetes (11.5% males, 9.2% females) and 19.7%prevalence of prediabetes(16.5% males, 23% females).Older age, larger waist circumference, and higher triglyceride levels were significant risk factors. The findings of this study highlight several important directions for future research. More diligent study designs, particularly randomized controlled trials, are needed to verify the causal effect of fenugreek on glycemic control and to address potential confounding factors. Long-term follow-up studies would help determine whether the improvements in blood glucose observed over three months are sustained over time. Research involving varied doses of fenugreek could clarify the optimal therapeutic amount, whilst studies conducted in more diverse populations would enhance the generalizability of the results beyond hospital employees. Besides, future investigations should include broader metabolic indicators—such as HbA1c, lipid profiles, and insulin resistance measures which help in provide a more comprehensive understanding of the intervention's physiological impact. Strengthening adherence monitoring and assessing dietary and lifestyle influences will further improve the accuracy of findings. At last, exploring the underlying mechanisms of fenugreek's hypoglycemic effects and examining its practical application in community and workplace health programs may offer valuable insights for advancing diabetes prevention strategies.

Ethical and Safety Considerations:

Participant safety was closely monitored throughout the intervention period. Regular follow-up appointments and telephone callbacks were conducted to identify any adverse events or side effects, including dizziness, drowsiness, headache, or symptoms of hypoglycemia. All participants were informed about potential reactions and instructed to report any concerns immediately, ensuring continuous monitoring and prompt management. The costs associated with biochemical assessments, including lipid profiles and HbA1c testing, were fully supported by the principal investigator in collaboration with the hospital. HbA1c analysis was facilitated through institutional support funded by the Chairman of the College of Nursing, while lipid profiling was conducted using a cholesterol analyzer available at the facility. Blood glucose measurements were obtained using the BeatO monitoring device, which provided both cost efficiency and reliable accuracy for repeated glucose assessments.

Conclusion

Medicinal plants have played an important role in treating and preventing a various diseases throughout the world. Fenugreek seed powder has an effect to reduce the blood sugar level. The study assessed the effectiveness of fenugreek seed powder on the blood sugar level of Prediabetic hospital employees. The findings of the present study revealed that fenugreek seed powder was highly effective.

After the administration of fenugreek seed power, the samples become familiar and found themselves comfortable and expressed satisfaction and they shared their experiences with the family members and others. They recommended others to follow the same. This ensures that administration of 05 grams of fenugreek seed powder daily helps to reduce the clinical profiles on blood sugar level among Prediabetic hospital employees and also it will help to reduce morbidity and mortality rate of employees with diabetes to live a healthy life.

Thus it can be concluded that administering fenugreek seed powder is one of the easy, cost effective and simple non-pharmacological interventions to solve the problems of subjects with Prediabetes.

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Conflict of Interest

The authors declare that there is no conflict of interest in this study.

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