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Cinnamon Tea As A Therapeutic Intervention For Type-2 Diabetes Patients

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Abstract:

According to new national estimates for diabetes, there were 101 million diabetics and 136 million prediabetics in India by 2021. Between 2019 and 2021, 31 million Indians developed diabetes. The present study evaluated the effect of cinnamon tea on type 2 DM by utilizing the experimental quantitative approach with a pre-test-post-test-control group design with a non-probability, purposive sampling technique. A total of 104 participants, i.e., 52 experimental and 52 control, were selected from the community area (stratum) according to the selection criteria.

Results showed that in the current investigation, the experimental group, following intervention with cinnamon tea, exhibited a significant difference in post-interventional blood sugar levels (p-value = 0.0001). The average PPBSL on day 8 was compared between the experimental and control groups using an unpaired t-test. On day 8, the mean PP BSL in the experimental group was 187.31 with a standard deviation of 14.51, while in the control group, it was 203.63 with a standard deviation of 11.91. The unpaired t-test statistic result was -5.54155, with a p-value of 0.000064. It indicates a significant difference in the average PPBSL on day 8 between the experimental and control groups at the 5% level of significance. As a result, H_0 was rejected, and H_1 was accepted.

The findings reveal that cinnamon tea is more effective in decreasing the blood sugar levels in type 2 diabetes patients.

Keywords: Diabetes mellitus (DM), Cinnamon, Blood glucose level (BSL), Tea

Introduction:

Type 2 diabetes mellitus (T2DM) occurs when the body's cells become resistant to insulin, a hormone that helps regulate blood glucose, or when the pancreas fails to produce enough insulin. Unlike type 1 diabetes, which is an autoimmune condition involving destruction of insulin-producing cells, type 2 diabetes is primarily associated with insulin resistance and relative insulin deficiency. Risk factors for type 2 diabetes mellitus (T2DM) include genetics, obesity, physical inactivity, an unhealthy diet, and increasing age. It often develops slowly and is more common in adults; however, increasing cases are being seen in younger populations due to lifestyle changes. Type 2 diabetes is highly prevalent in India, especially in urban regions and older age groups. According to the largest community-based study (ICMR INDIAB), the overall prevalence of T2DM in India was found to be 7.3% among adults aged 20 years or older, with urban prevalence at 11.2% and rural prevalence at 5.2%.[1]

The prevalence of diabetes mellitus (DM) among adults aged 45 years and older in India is 19.8%. In urban areas, the prevalence is notably higher at 30.0%, about twice that of rural areas, which stand at 15.0%. The prevalence of diabetes mellitus (DM) among adults aged 45 years and older in Maharashtra

is approximately 25.7% according to the nationally representative Longitudinal Aging Study in India (LASI) conducted from 2017 to 2019. This corresponds to about 5.8 million adults living with diabetes in Maharashtra in this age group. Maharashtra is among the states with the highest total number of people aged 45 and above with diabetes in India.[2]

Cinnamon is a spice and herbal drug derived from the dried inner bark of trees belonging to the genus Cinnamomum (family Lauraceae). Cinnamon is derived from the Greek word 'kinnamomon', which means sweet tree. Cinnamon is traditionally used as a flavouring agent and for its medicinal properties.[3] Cinnamomum possesses numerous health-promoting properties and has demonstrated a protective effect in type 2 diabetes mellitus.[4]

Though many studies have reported the effect of cinnamon in the management of type 2 diabetes, many of these studies are conducted using cinnamon supplementation, and very few studies are conducted using cinnamon tea. Due to the limited evidence on using cinnamon tea for the management of type 2 diabetes, the present study aimed to find out the effect of cinnamon tea in the management of diabetes.

Materials & Methods:

a) Ethical Approval & Consent:

The study received approval from the Institute Ethics Committee of Bharati Vidyapeeth (Deemed to be University), College of Nursing (BVDU/CON/SAN/463/2023-24). All participants were over 18 years old and provided written informed consent.

b) Preparation of Cinnamon tea:

To prepare the cinnamon tea used in the study, 60 grams of cinnamon sticks were soaked in 1,000 milliliters of water and left at room temperature for 24 hours. After soaking, the mixture was heated for 20 minutes at 100°C. Once heated, it was allowed to cool to room temperature and then strained to obtain a clear cinnamon solution. Each participant in the experimental group received an individual dose of 100 milliliters of this prepared cinnamon tea.

c) Data Collection:

In this study, the researcher adopted a quantitative research approach using a pre-test-post-test control group design. The investigation focused on examining the effect of cinnamon tea on blood sugar levels, with the administration of cinnamon tea serving as the independent variable and blood sugar level as the dependent variable. The research was carried out in selected areas within the Sangli-Miraj-Kupwad Municipal Corporation, Maharashtra, India. Participants were individuals diagnosed with type 2 diabetes mellitus, residing in the specified regions. To ensure the reliability and relevance of the data, participants were selected based on clearly defined inclusion and exclusion criteria. The sample size of 104 participants was determined using a power analysis formula, with 52 individuals assigned to the experimental group and 52 to the control group.

To collect data for the study, the researcher used a glucometer, along with an observation chart, to record the fasting blood sugar levels (FBSL) and post-prandial blood sugar levels (PPBS) of participants in both the experimental and control groups. Blood samples were obtained using the prick method. FBSL was measured before the administration of cinnamon tea, while PPBS was recorded over a period of eight consecutive days. Data collection for each participant took approximately three hours per session.

In the experimental group, fasting blood sugar levels were measured first, a process that took around five minutes. Following this, each participant received a 100 mL dose of cinnamon tea. After a 30-minute interval, participants consumed their prescribed breakfast as recommended by their healthcare providers. Two hours after the meal, the researcher measured and recorded their post-prandial blood sugar levels. Participants were also advised to report promptly any adverse side effects they experienced during the study.

d) Data Analysis:

We used a paired t-test to compare within the experimental and control groups and an unpaired t-test to compare between the experimental and control groups. The demographic data was analysed by frequency and percentage.

Results:

Table No. 1: Frequency and percentage distribution of demographic data

				N=52+52=104	
		Experimental G.		**Control G.**	
		F	**%**	**F**	**%**
1.	**Duration of Illness**				
1.1	Less than 1 year	12	23.08	14	26.92
1.2	1-5 years	17	32.69	**21**	**40.39**
1.3	5 years and above	**23**	**44.23**	17	32.69
2.	**Family H/O DM-**				
2.1	Yes	**39**	**75**	**31**	**59.61**
2.2	No	13	25	21	40.39
3	**Dietary Habits**				
3.1	Vegetarian	8	15.39	11	21.15
3.2	Non-vegetarian	**44**	**84.61**	**41**	**78.85**

Duration of Illness-In the experimental group the majority of the participants 20(38.47%) were having type 2 diabetes for 5 years and above, 17(32.69%), were having 1-5 years, and 12(23.08%) had less than one year, whereas in the control group, majority of the participants 21(40.39%) were having type 2 diabetes 1-5 years, , 17(32.69%), were having since 5 years and above and 14(26.92%) were having less than one year.

Family H/O DM-In the experimental group, the majority of the participants, 39(75%), had family h/o DM, and 13(25%), had no family h/o DMs, whereas in the control group, the majority of the participants 31(59.61%) had family h/o DM, 21(40.39%), had no family h/o DM.

Dietary Habits- In both groups, the majority of the participants, 44(84.61%), 41(78.85%), were non-vegetarian, and only 8(15.39%), and 11(21.15%) were vegetarian, respectively.

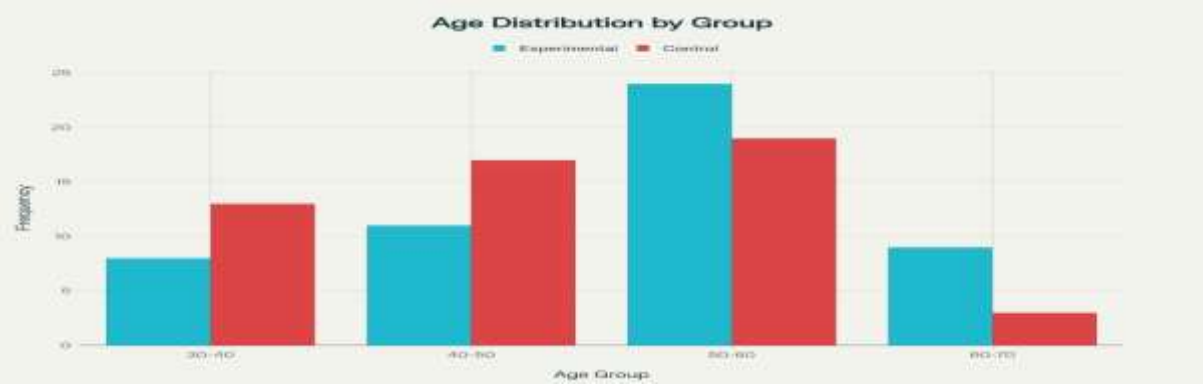

Fig. 1- Age distribution by group

Age (in years)-In the experimental group the majority of the participants 24(46.16%) were from the age group of 50-60 years, 11(21.15%), were from the age group of 40-50 years, 9(17.3%) were from the age group of 60-70 years, 8(15.39%) were from the age group of 30-40 years, whereas in the control group, the majority of the participants 19(36.52%) were from the age group of 50-60 years, 17(32.7%), were from the age group of 40-50 years, 13(25%) were from the age group of 30-40 years, and 3(5.78%) were from the age group of 60-70 years.

Fig.2- Gender distribution by group

Gender- In the experimental group, the majority of the participants, 30(57.7%), were males, and 22(42.3%) were females, whereas in the control group, the majority of the participants, 29(55.77%), were males, and 23(44.23%) were females.

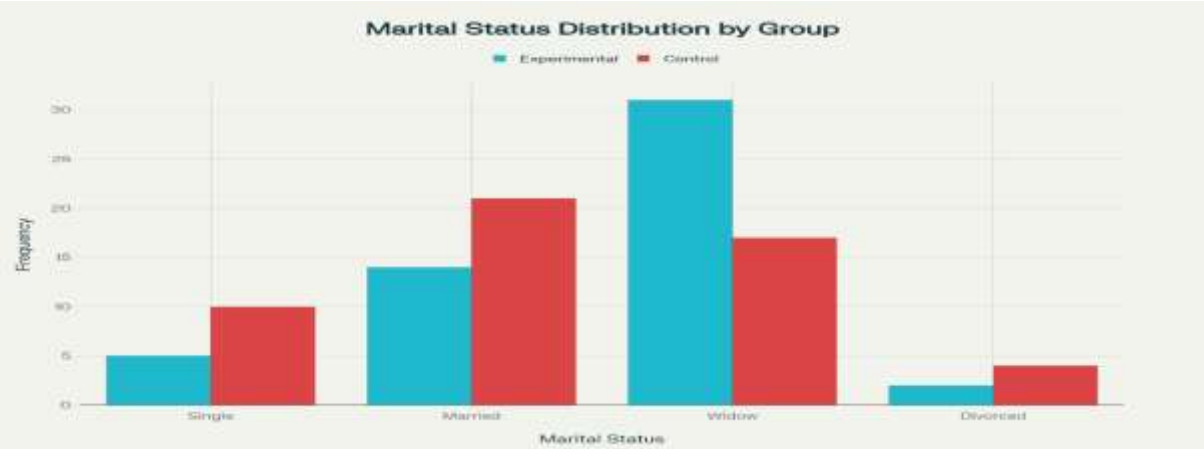

Fig.3 Marital Status Distribution by group

Marital status- In the experimental group the majority of the participants 31(59.61%) were widow/widowers, 14(26.93%), were married, 5(9.61%) were single, and 2(3.85%) were divorced, whereas in the control group, the majority of the participants 21(40.38%) were married, 17(32%), were widow/widower, 10(19.23%) were single, and 4(7.7%) was divorced.

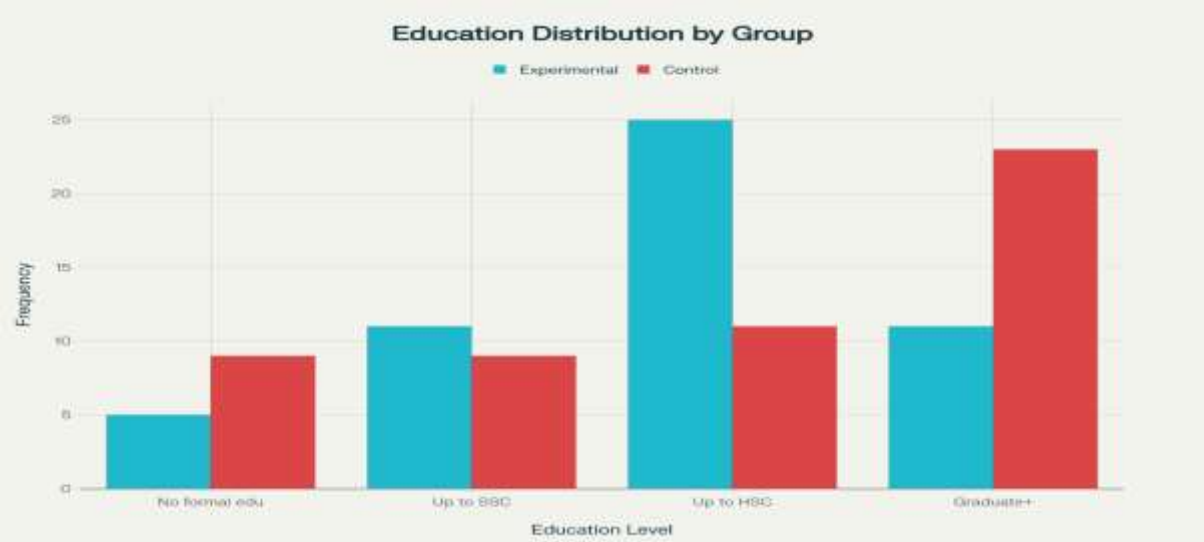

Fig.4- Education Distribution by Group

Education- In the experimental group the majority of the participants 25(48.07%) studied up to HSC, and 11(21.16%), were studied up to SSC, and graduated and above respectively, whereas in the control group the majority of the participants 23(44.23%), were studied graduate and above, 11(21.17%) were studied up to HSC, 9 (17.3%), were studied up to SSC, and no formal education respectively.

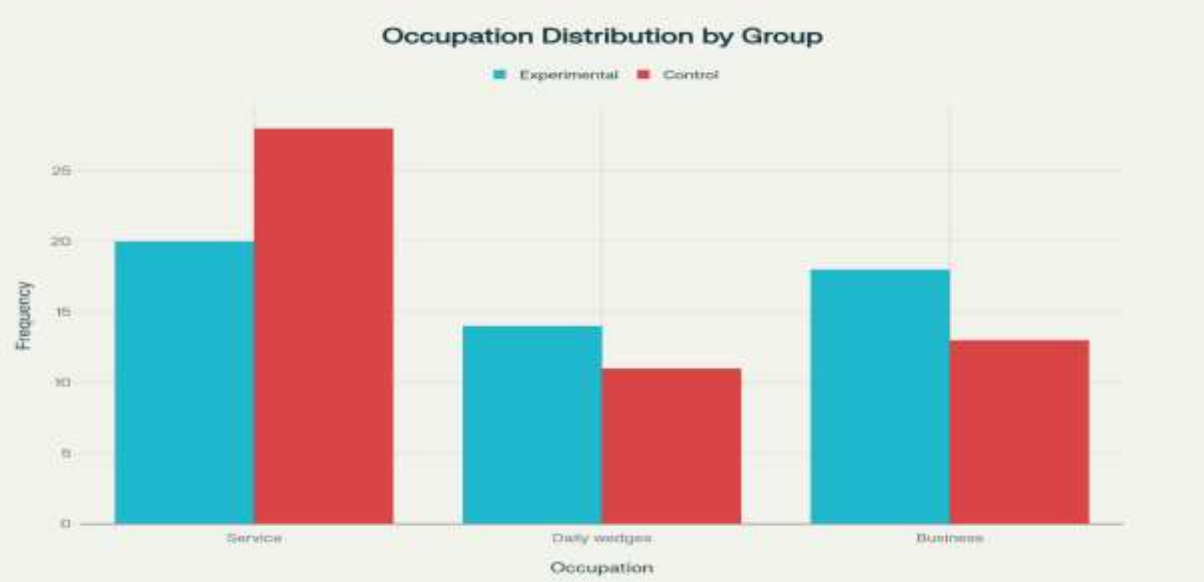

Fig.5 Occupation by Group

Occupation- In the experimental group the majority of the participants 23(44.23%) suffered since, 18(34.61%), were doing business, and 14(26.92%) were daily wedges workers, whereas in the control

group, the majority of the participants 28(53.85%) were doing service, 13(25%), were doing business, and 11(21.15%) were daily wedges workers.

Table No.2: Comparison between pre-test & post-test BSL within the experimental group

n=52

FBSL	Frequency (f)	Mean	S.D.	t -value	P -value
1st Day	52	159.86	10.11	6.71	0.00 **Significant**
8th Day	52	133.23	11.37		
PPBSL	**Frequency (f)**	**Mean**	**S.D.**	**t value**	**P value**
1st Day	52	223.7	13.63	22.4	0.00 **Significant**
8th Day	52	187.31	14.51		

FBSL- Fasting Blood Sugar Level

PPBSL- Post Prandial Blood Sugar Level

Table No.2 depicts the results that the paired t-test was used to compare the experimental group's average fasting BSL on days 1 and 8. The average fasting BSL on day one was 159.86 with a standard deviation of 10.11, whereas on day eight it was 133.23 with a standard deviation of 11.37. The paired t-test statistic value was 6.71, with a p-value of 0.0001. There was a significant difference in the average fasting BSL at the 5% level of significance. The experimental group's post-prandial BSL was compared on days 1 and 8 using the paired t-test. On day one, the average postprandial BSL was 223.7 with a standard deviation of 13.63, while on day eight, it was 187.31 with a standard deviation of 14.51. The test statistic value of the paired t-test was 5.541, with a p-value of 0.0001. There was a significant difference in the average post-prandial BSL at the 5% level of significance. There was a significant difference in the average post-prandial BSL at the 5% level of significance.

Table No.3: Comparison between pre-test & post-test BSL within the control group

n=52

FBSL	Frequency	Mean	S.D.	t value	P value
1st Day	52	162.43	11.81	2.76	0.32 Not significant
8th Day	52	160.76	10.32		
PPBSL	**Frequency**	**Mean**	**S.D.**	**t value**	**P value**
1st Day	52	241.52	14.39	4.69	0.001 Significant
8th Day	52	203.63	11.91		

FBSL- Fasting Blood Sugar Level

PPBSL- Post Prandial Blood Sugar Level

Table No.3 depicts that the paired t-test was used to compare the control group's average fasting BSL on days 1 and 8. On day one, the average fasting BSL was 162.76 with a standard deviation of 11.81. On day 8, the average fasting BSL was 160.76, with a standard deviation of 10.32. The test statistic value of the paired t-test was 1.37, with a p-value of 2.76. The p-value of greater than 0.05 indicates that there was no significant difference in the average fasting BSL at the 5% level of significance. The paired t-test was used to compare the control group's post-prandial BSL on days 1 and 8. On day one, the average post-prandial BSL was 241.52, with a standard deviation of 14.39. Day 8's average post-prandial BSL was 208.63 with a standard deviation of 11.91. The paired t-test statistic value was 4.69,

with a p-value of 0.001. The p-value> 0.05 indicated a significant difference in the average post-prandial BSL at the 5% level of significance.

Table 4: Comparison of post-test PPBSL between experimental and control groups on day one.

n=52+52=104

Day-1	Frequency	Mean	S.D.	t value	P value	Result
Experimental group	52	223.7	13.63	-1.18091	0.130258	Not significant
Control group	52	241.52	14.39			

Table No.4 depicts the findings of the comparison of the average PPBSL of day 1 between the experimental and the control group was done by the unpaired t-test. The mean PP BSL on day one in the experimental group was **223.7** with a standard deviation of **13.63,** while in the control group, it was **241.52** with a standard deviation of **14.39.** The unpaired t-test statistic result was **-1.18091,** with a p-value of 0.130. The p-value of more than 0.05 indicates that there was no significant difference in the average PPBSL on day 1 between the experimental and control groups at the 5% level of significance.

Table 5: Comparison of post-test PPBSL between experimental and control groups on day 8th.

n=52+52=104

Day-8	Frequency	Mean	S.D.	t value	P value	Result
Experimental group	52	187.31	14.51	**5.54155**	**0.000064**	Significant
Control group	52	203.63	11.91			

Table No.5 depicts the findings that the comparison of the average PPBSL of day 8 between the experimental and the control group was done by the unpaired t-test. The day 8 mean of PP BSL in the experimental group was 187.31 with a standard deviation of 14.51, and the mean of PP BSL in the control group was 203.63 in SD of 11.91. The unpaired t-test statistic result was -5.54155, with a p-value of 0.000064. The p-value greater than 0.05 indicates a significant difference in the average PPBSL on day 8 between the experimental and control groups at the 5% level of significance. As a result, H0 was refused, whereas H1 was accepted. The results show that cinnamon tea is more efficient in lowering fasting and postprandial blood sugar levels in the type 2 diabetes mellitus group of experimental samples than in the control group receiving routine medication.

Discussion:

Cinnamon has long been recognized as a traditional remedy and spice, and in recent years, its role in blood sugar management, particularly for people with type 2 diabetes, has attracted substantial scientific attention. This discussion synthesizes recent research findings and personalizes the meaning and implications of these results for patients, families, and healthcare professionals.

Cinnamon supplementation, particularly as tea or infusion, has been studied for its effect on blood glucose control in type 2 diabetes across various clinical and experimental designs. The present study

found that cinnamon consumption led to a statistically significant reduction in both fasting and postprandial blood glucose levels in the experimental group compared to baseline and control, with post-test PPBSL on day eight being markedly lower (mean = 187.31 mg/dL vs. 203.63 mg/dL, $t = 5.54$, $p < 0.001$).

These findings align with a growing body of literature supporting the hypoglycemic effects of cinnamon. Multiple systematic reviews and randomized trials reported that cinnamon intake—whether as powder, extract, or infusion—can decrease fasting plasma glucose and postprandial values in people with type 2 diabetes, as well as in healthy subjects. For example, Hlebowicz et al. demonstrated a significant reduction in postprandial blood glucose and delayed gastric emptying after cinnamon ingestion in healthy subjects. Several more recent studies and meta-analyses indicate similar findings in diabetic populations, showing moderate reductions in fasting glucose and improved insulin sensitivity.[5–10]

The present study's observed reduction in PPBSL is consistent with studies employing cinnamon infusions, which showed significant decreases in both fasting and postprandial glucose levels after short-term intervention. The mean decrease of 41.33 mg/dL in blood glucose observed here is comparable to that reported in other intervention studies, such as the decrease from 255.8 to 193.05 mg/dL in cinnamon tea-treated diabetes patients, and reductions in plasma glucose after cinnamon supplementation of various forms.[6–8,10]

The 2018 triple-blind RCT shows that cinnamon supplementation over 3 months significantly improved glycemic indices, insulin resistance, and lipid profiles, particularly in patients with a higher baseline BMI (≥27). This points to potential personalized approaches, where BMI and longer intervention duration could be critical for the effectiveness of cinnamon as a complementary therapy.[11]

Conclusion:

Based on the results of the study, it can be concluded that the intervention had a significant positive impact on blood sugar levels among the experimental group when compared both internally (pre-test vs. post-test) and against the control group. Within the experimental group, both fasting blood sugar levels (FBSL) and postprandial blood sugar levels (PPBSL) showed statistically significant reductions from baseline to the eighth day of measurement. Specifically, FBSL decreased from a mean of 159.86 mg/dL to 133.23 mg/dL, and PPBSL declined from 223.7 mg/dL to 187.31 mg/dL, with p-values less than 0.001 indicating strong significance.

In contrast, the control group demonstrated no significant change in fasting blood sugar levels during the same period, with means moving insignificantly from 162.43 mg/dL to 160.76 mg/dL ($p = 0.32$). However, the control group did show a statistically significant reduction in postprandial blood sugar levels from 241.52 mg/dL to 203.63 mg/dL ($p = 0.001$), although this reduction was less pronounced compared to the experimental group.

When comparing the experimental and control groups directly, the postprandial blood sugar levels on the first day did not differ significantly. By the eighth day, however, the experimental group exhibited significantly lower postprandial blood sugar levels than the control group (mean 187.31 mg/dL vs. 203.63 mg/dL, $p < 0.0001$), highlighting the efficacy of the intervention in improving glycemic control.

Overall, these findings support that the intervention administered to the experimental group effectively lowers both fasting and postprandial blood glucose levels in patients. The control group's minimal or nonsignificant changes emphasize the robustness of the intervention's effect. These results suggest that the studied intervention could be a valuable approach for managing blood sugar levels in diabetic patients and warrant further research with a larger sample size and extended duration for confirmation.

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