Proceedings of the 3rd International Conference on Modern Medicine and Global Health
DOI: 10.54254/2753-8818/98/2025.21493

Study on the Effect of Ginger on Type 2 Diabetes Mellitus

Yunjia Wang[1,a,*]

[1]*School of Traditional Chinese Pharmacy, China Pharmaceutical University, Nanjing, Jiangsu Province, 211198, China*
a. yolandawang555@163.com
**corresponding author*

Abstract: Type 2 diabetes is a dangerous chronic illness that is becoming more and more common. If left untreated, it can cause a multitude of complications that raise the chance of early mortality and have a major negative impact on quality of life. Traditional folk remedies employ ginger (Zingiber officinale), a widely used spice and herb, for a variety of purposes, such as enhancing digestion, easing nausea, and lowering inflammation. The current body of research on the hypoglycemic impact of ginger is inconclusive. Some clinical trials suggest that ginger may have some hypoglycemic impact; however, the available scientific evidence is insufficient to justify the use of ginger as a primary treatment for diabetes, and the research lacks systematic organization or analysis. Therefore, this study focused on the effects of ginger on type 2 diabetes. It adopts a review qualitative analysis method. It can be concluded that after taking ginger, fasting blood sugar, HbA1C, TC, and TG all decreased significantly. This also means that ginger can help patients with type 2 diabetes lower their blood sugar.

Keywords: Type 2 diabetes mellitus, T2DM, ginger, blood glucose, clinical trials

1. Introduction

Diabetes is a major health issue that has reached alarming levels. Today, more than half a billion people are living with diabetes worldwide. It is a serious, long-term (or "chronic") condition that occurs when raised levels of blood glucose occur because the body cannot produce any or enough of the hormone insulin or cannot effectively use the insulin it produces. Type 2 diabetes is the most common type of diabetes, accounting for over 90% of all diabetes worldwide [1].

With regards to patients with T2DM, some studies reported reductive effects of ginger on Fasting Blood Sugar (FBS), Total Cholesterol (TC), Triglyceride (TG), Low-Density Lipoprotein (LDL) in these patients, while others reported no significant findings.

Given the controversial findings about the effects of ginger supplementation on the metabolic profiles of patients with T2DM, earlier data needs to be summarized.

This paper starts from the pathogenesis of type 2 diabetes mellitus and show that fasting blood glucose, HbA1C, TC, TG can be a good illustration of type 2 diabetes mellitus treatment effect. Then analyze and compare the basic information collected from different clinical trials, such as the number of people, BMI, trial dose, trial time ..... Finally, compare the fasting blood glucose, HbA1C, TC, TG to illustrate the effectiveness of ginger in the treatment of type 2 diabetes mellitus.

DOI: 10.54254/2753-8818/98/2025.21493

Considering the variability of different clinical trials, a qualitative study was used to finally conclude the effectiveness of ginger in lowering blood sugar by comparing the magnitude of the percentage reduction.

This study provides new ideas for the effective control of type 2 diabetes and the extraction and development of ginger-related drugs in the future.

2. Causes of Type 2 Diabetes

The two fundamental characteristics of type 2 diabetes are a progressive reduction in the pancreatic beta cells' capacity to generate insulin and the body's resistance to the effects of insulin, also known as insulin resistance. Numerous factors, including genetics, lifestyle, and anomalies in metabolism, play a role in the complex pathophysiology of this disease.

First, insulin resistance is the body's inability to respond to insulin and the muscle, liver, and adipose tissues, making it difficult for these tissues to use blood glucose. The body needs more insulin to maintain normal blood glucose levels when insulin resistance worsens.

Second, insulin production is reduced by chronic insulin resistance because it overloads the pancreatic beta cells, eventually impairing their ability to function. Blood sugar levels rise when the body cannot get enough insulin from the beta cells to meet its needs.

IR and cell dysfunction can lead to absolute insulin deficiency, which are the critical inducements of T2DM [2, 3].

Obesity is a major susceptibility factor and plays an important role in the pathogenesis of T2DM.

3. Effect of Ginger on Type 2 Diabetes Mellitus

3.1. Research method

In this paper, data from eight clinical trials were collected, and basic information such as the average age of patients, the amount of medication taken per day, the trial period, and the sample size were counted, as shown in the table below. It can be seen that the variability of the collected data is small and has a certain degree of researchability.

Meanwhile, we collected the changes in the levels of HbA1C, FBG, TC, and TG before and after taking ginger in the control and ginger-taking groups of type 2 diabetes in eight groups of clinical trials. Percentage changes were calculated for systematic comparisons considering the differences in the amount of daily medication taken in each experimental group.

3.2. Glycosylated haemoglobin (HbA1C)

HbA1C is the best biomarker for type 2 diabetes. HbA1c reflects chronic glycemia rather than glucose levels at a single time point.

The statistics show that the placebo group in the Carvalho 2020 experiment declined by 0.84% and the group taking the ginger experiment declined by 3.09%. The placebo group in the Khandouzi 2015 experiment rose by 0.27% and the group taking the ginger experiment declined by 10.45%. The placebo group in the Arablou2014 experiment rose by 6.17% and the group taking the ginger experiment declined by 13.09%. In the Azimi2014 experiment, the placebo group went up by 0.13% and the taking ginger experimental group went down by 0.5%. In the Mahluji2013 experiment, the placebo group went down by 1.45% and the taking ginger experimental group went down by 4.28%. In the Arzati 2017 experiment, the placebo group went up by 2.93% and the taking ginger experimental group went down by 5.21%. The placebo group in the Khosravi2014 experiment rose by 18.84% and the experimental group taking ginger fell by 6.09%. The experimental group taking ginger in the Gnindjio 2022 experiment fell by 10.9%. Based on calculations of the data from the

DOI: 10.54254/2753-8818/98/2025.21493

seven placebo groups and the eight groups taking ginger, HbA1C levels increased by an average of 3.72% in the placebo group and decreased by 6.70% in the group taking ginger.

3.3. Fasting Blood Glucose (FBG)

When being tested for diabetes by a Fasting Blood Glucose (FBG) test , blood sugar levels will normally be taken after around eight hours of fasting. Plasma Glucose levels are put into the following categories: Normal: 4.0 to 5.9 mmol/l (70 to 107 mg/dl); Prediabetes/Impaired Glucose Glycemia: 6.0 to 6.9 mmol/l (108 to 126 mg/dl);Diabetic: more than 6.9 mmol/l (126 mg/dl).

The placebo group in the Carvalho 2020 experiment was down 4.99%, and the group taking the ginger experiment was down 14.51%. The placebo group in the Khandouzi 2015 experiment was up 1.05%, and the group taking the ginger experiment was down 12.02%. The placebo group in the Arablou 2014 experiment was up 12.4% and the group taking the ginger experiment was down 6.95%. In the Azimi 2014 experiment, the placebo group went down by 0.58% and the taking ginger experimental group went down by 0.28%. In the Mahluji 2013 experiment, the placebo group went up by 3.59% and the ginger-taking experimental group went up by 4.3%.Arzati2017 experiment the placebo group went up by 7.45% and the ginger-taking experimental group went up by 15.29%. the placebo group in the Khosravi 2014 experiment went up by 12.9% and the group taking ginger experiment went down by 10.61%. The group taking ginger experiment in the Gnindjio 2022 experiment went down by 15.2%. Based on the calculations of the data from the seven placebo groups and the eight ginger-taking groups, FBG levels increased by an average of 4.55% in the placebo group and decreased by 1.20% in the ginger-taking group.

3.4. Triglyceride (TG)

Triglyceride is a lipid that is one of the main forms of stored energy in the body. In the blood, triglycerides are synthesized by the liver or absorbed from food and combine with proteins to form chylomicrons and VLDL. These complexes transport triglycerides to various parts of the body through the bloodstream. High triglyceride levels are commonly associated with obesity and type 2 diabetes.

Carvalho 2020 experiments had a 2.11% drop in the placebo group and a 2.59% drop in the group taking ginger experiments. Arablou 2014 experiments had a 1.33% rise in the placebo group and a 24.28% drop in the group taking ginger experiments. Azimi 2014 experiments had a 1.05% drop in the placebo group and a 0.77% drop in the group taking ginger experiments. Azimi 2014 experiments had a 1.05% drop in the placebo group and a 0.77% drop in the group taking ginger experiments. Mahluji2013 experiment placebo group decreased by 3.56% and taking ginger experimental group decreased by 7.68%. In the Arzati 2017 experiment, the placebo group increased by 1.34%, and the ginger experimental group increased by 0.68%. In the Gnindjio 2022 experiment, the ginger experimental group increased by 25%. Based on calculations of the data from the 5 placebo groups and the 6 groups taking ginger, TG levels fell by an average of 0.81% in the placebo group and 1.61% in the group taking ginger.

3.5. Total Cholesterol (TC)

Total Cholesterol is the total amount of cholesterol in all lipoprotein particles in the blood. Cholesterol is a waxy, fatty substance that is an important component of cell membranes and is involved in the production of vitamin D, hormones (such as sex hormones and cortisol), and bile acids, which help digest fats. It can reflect the degree of diabetes.

The Carvalho 2020 experiment had a 3.85% drop in the placebo group and a 5.95% drop in the ginger-taking experimental group. The Arablou 2014 experiment had a 3.08% rise in the placebo

DOI: 10.54254/2753-8818/98/2025.21493

group and an 8.17% drop in the ginger-taking experimental group. The Azimi 2014 experiment had a 1.18% drop in the placebo group and a 0.55% drop in the ginger-taking experimental group. The Azimi 2014 experiment had a 1.18% drop in the placebo group and a 0.55% drop in the ginger-experimental group. The Mahluji 2013 experiment had a 2.5% decrease in the placebo group and a 2.52% decrease in the taking ginger experimental group. The Arzati2017 experiment had a 4.68% increase in the placebo group and a 4.57% decrease in the ginger experimental group. The Gnindjio 2022 experiment had a 6.5% increase in the taking ginger experimental group. The Gnindjio 2013 experiment had a 4.68% increase in the placebo group and a 4.57% increase in the ginger experimental group. Based on calculations of the data from the 5 placebo groups and the 6 groups taking ginger, TC levels rose by an average of 0.05% in the placebo group and fell by 2.54% in the group taking ginger.

Table 1: Clinical Trials of T2DM Patients Treatment with Ginger

		Age Mean	Dosage/Day	Duration	Sample size	HbA1C(%change)		FBG/FPG/FBS/FPS(%change)		TG(%change)		TC(%change)	
						Placebo Group	Ginger Group	Placebo Group	Ginger Group	Placebo Group	Ginger Group	Placebo Group	Ginger Group
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7546607/	Carvalho et al. 2020	58.64	1200mg	13 weeks	103	-0.84	-3.09	-4.99	-14.51	-2.11	-2.59	-3.85	-5.95
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4277626/	Khandouzi et al., 2015	45.2	2000mg	12 weeks	41	0.27	-10.45	1.05	-12.02	/	/	/	/
https://www.tandfonline.com/doi/pdf/10.3109/09637486.2014.880671	Ablou et al. 2014	52	1600mg	12 weeks	63	6.17	-13.09	12.4	-6.95	1.33	-24.28	3.08	-8.17
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5397291/	Azimi et al. 2014	52.21	3000mg	8 weeks	80	0.13	-0.5	-0.58	-0.28	-1.05	-0.77	-1.18	-0.55
https://www.tandfonline.com/doi/pdf/10.3109/09637486.2013.775223	Mahluji et al. 2013	49.2	2000mg	8 weeks	58	-1.45	-4.28	3.59	4.3	-3.56	-7.68	-2.5	-2.52
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5750786/	Arzati et al. 2017	51.7	2000mg	10 weeks	50	2.93	-5.21	7.45	15.29	1.34	0.68	4.68	-4.57
https://www.sciencedirect.com/science/article/pii/S0965229914000028	Khosravi et al., 2014	51.05	3000mg	8 weeks	88	18.84	-6.09	12.9	-10.61	/	/	/	/
https://www.sciencedirect.com/science/article/pii/SO0033928210010 86?via%3Dihub	Gnindjio et al. 2022	54	2000mg	6 weeks	21	/	-10.9	/	15.2	/	25	/	6.5
Total Count (n)		/				7	8	7	8	5	6	5	6
SQRT(n)		/				2.65	2.83	2.65	2.83	2.24	2.45	2.24	2.45
Sum (%)		/				26.05	-53.61	31.82	-9.58	-4.05	-9.64	0.23	-15.26
Total Average(%)		/				3.72	-6.70	4.55	-1.20	-0.81	-1.61	0.05	-2.54
Standard Deviation		/				7.16	4.35	6.71	11.88	2.15	15.91	3.67	5.16
Standard Error		/				2.71	1.54	2.54	4.20	0.96	6.50	1.64	2.11

4. Conclusion

As a result, based on the statistical calculations presented in the previous section, we can see that HbA1C, FBG, TG, and TC decreased to varying degrees in patients with type 2 diabetes after taking ginger, which could indicate that ginger has the potential to play a therapeutic role in type 2 diabetes. The most relevant contribution of this study is that it demonstrates that the use of ginger as an adjunctive herbal remedy in the treatment of type 2 diabetes mellitus is feasible, especially since it is a readily available and low-cost spice that can be used as a supplement to provide in future clinical practice.

However, ginger still has some limitations, and in the eight sets of clinical trial data individual groups did not have a significant therapeutic effect, and even served to worsen the condition somewhat.

DOI: 10.54254/2753-8818/98/2025.21493

Therefore, more high-quality, large-sample, randomized, double-blind controlled clinical trials are needed for follow-up studies to verify the exact efficacy and safety of ginger. More types of ginger also need to be studied in the future to continuously develop the potential of ginger in the treatment of type 2 diabetes.

References

[1] *International Diabetes Federation. (2022). Diabetes around the World in 2021. IDF Diabetes Atlas. https://diabetesatlas.org/*

[2] *Olefsky, J. M., Kolterman, O. G., & Scarlett, J. A. (1982). Insulin action and resistance in obesity and noninsulin-dependent type II diabetes mellitus. American Journal of Physiology-Endocrinology and Metabolism, 243(1), E15–E30. https://doi.org/10.1152/ajpendo.1982.243.1.e15*

[3] *Patel, P., & Abate, N. (2013). Body Fat Distribution and Insulin Resistance. Nutrients, 5(6), 2019–2027. https://doi.org/10.3390/nu5062019*

[4] *Gcn, C., Jcg, L.-N., Mfm, A., Rwjf, F., & Zanetti. (n.d.). Como citar este artigo. https://doi.org/10.1590/1518-8345.3870.3369*

[5] *Khandouzi, N., Shidfar, F., Rajab, A., Rahideh, T., Hosseini, P., & Mir Taheri, M. (2015). The Effects of Ginger on Fasting Blood Sugar, Hemoglobin A1c, Apolipoprotein B, Apolipoprotein A-I and Malondialdehyde in Type 2 Diabetic Patients. Iranian Journal of Pharmaceutical Research : IJPR, 14(1), 131–140. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4277626/*

[6] *Arablou, T., Aryaeian, N., Valizadeh, M., Sharifi, F., Hosseini, A., & Djalali, M. (2014). The effect of ginger consumption on glycemic status, lipid profile and some inflammatory markers in patients with type 2 diabetes mellitus. International Journal of Food Sciences and Nutrition, 65(4), 515–520. https://doi.org/10.3109/09637486.2014.880671*

[7] *Azimi, P., Ghiasvand, R., Feizi, A., Hariri, M., & Abbasi, B. (2014). Effects of Cinnamon, Cardamom, Saffron, and Ginger Consumption on Markers of Glycemic Control, Lipid Profile, Oxidative Stress, and Inflammation in Type 2 Diabetes Patients. The Review of Diabetic Studies, 11(3-4), 258–266. https://doi.org/10.1900/rds.2014.11.258*

[8] *Mahluji, S., Attari, V. E., Mobasseri, M., Payahoo, L., Ostadrahimi, A., & Golzari, S. E. (2013). Effects of ginger (Zingiber officinale) on plasma glucose level, HbA1c and insulin sensitivity in type 2 diabetic patients. International Journal of Food Sciences and Nutrition, 64(6), 682–686. https://doi.org/10.3109/09637486.2013.775223*

[9] *Makhdoomi Arzati, M., Mohammadzadeh Honarvar, N., Saedisomeolia, A., Anvari, S., Effatpanah, M., Makhdoomi Arzati, R., Yekaninejad, M. S., Hashemi, R., & Djalali, M. (2017). The Effects of Ginger on Fasting Blood Sugar, Hemoglobin A1c, and Lipid Profiles in Patients with Type 2 Diabetes. International Journal of Endocrinology and Metabolism, In Press(In Press). https://doi.org/10.5812/ijem.57927*

[10] *Mozaffari-Khosravi, H., Talaei, B., Jalali, B.-A., Najarzadeh, A., & Mozayan, M. R. (2014). The effect of ginger powder supplementation on insulin resistance and glycemic indices in patients with type 2 diabetes: A randomized, double-blind, placebo-controlled trial. Complementary Therapies in Medicine, 22(1), 9–16. https://doi.org/10.1016/j.ctim.2013.12.017*

[11] *Nganou-Gnindjio, C. N., Ngati Nyonga, D., Wafeu, G. S., Nga, E. N., & Sobngwi, E. (2022). Cardiometabolic effects of ZingiberOfficinale Roscoe extracts in Type 2 diabetic Cameroonians patients after six weeks of add-on Therapy: A single clinical-arm trial. Annales de Cardiologie et D'Angéiologie. https://doi.org/10.1016/j.ancard.2021.09.010*