

ARTICLE INFORMATION

Received: September, 24, 2025

Revised: February, 1, 2026

Available online: February, 1, 2026

at : <https://e-jurnal.iphorr.com/index.php/minh>

Effect of turmeric (*Curcuma longa* L.) on blood glucose control in patients with diabetes mellitus

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Abstract

Background: Diabetes mellitus (DM) cases remain a global concern. DM is often referred to as the "silent killer" because its symptoms are often not noticeable in the early stages. DM can cause serious complications, such as kidney damage and even amputation. This is a serious public health issue. DM requires long-term treatment because it is a chronic disease that will be suffered with for life, where optimal blood sugar level management is the main focus of its treatment. Long-term medical treatment for DM often causes side effects and places a significant economic burden on patients. A natural, safe, and affordable supportive therapy approach is essential as part of comprehensive DM management. One plant with potential as a supportive therapy is turmeric leaf (*Curcuma longa*).

Purpose: To determine the effectiveness of turmeric leaf decoction (*curcuma longa*) as a supportive therapy in lowering blood sugar levels in patients with diabetes mellitus.

Method: This study was quasi-experimental and used a one-group pre-test-post-test design with control. The sample consisted of 60 DM patients (30 patients in the control group and 30 patients in the intervention group) who were treated at the Trucuk Klaten Community Health Center. The sampling technique used was purposive sampling. Blood sugar levels in the sample were measured using a glucometer. The data results were measured using the Mann-Whitney test.

Results: Turmeric leaf decoction affected lowering blood sugar levels in diabetic patients with a p-value = 0.001 ($p < 0.005$).

Conclusion: This non-pharmacological therapy using turmeric leaf decoction can be used as a supportive therapy for diabetic patients because it contains bioactive compounds such as flavonoids, tannins, and saponins, which are believed to have the potential to help lower blood glucose levels.

Keywords: Blood Sugar Levels; Diabetes Mellitus; Effectiveness; Supportive Therapy; Turmeric Leaves (*Curcuma Longa*).

INTRODUCTION

Diabetes mellitus (DM) is a chronic condition that occurs when the body is unable to produce adequate insulin or when the insulin produced is not used effectively (Moonti & Armanada, 2023). DM remains a global concern; according to the WHO, diabetes mellitus (DM) is the sixth leading cause of death worldwide. The prevalence of DM is expected to continue to increase. In Indonesia, the number of

diabetes patients has risen from 8.4 million in 2000 to an estimated 21.3 million in 2030 (Andini & Awwalia, 2018).

There was a total of 647,093 cases of DM in Central Java. At the Trucuk Klaten Community Health Centre in 2017, 732 people were suffering from diabetes mellitus, and in 2020, there was a drastic increase to 1,140 (Klaten District Health

Office, 2020). This may be due to changes in lifestyle, with people paying less attention to healthy eating, lack of physical activity, and smoking. DM is often called the "silent killer" because its symptoms are often not felt at first. This disease can cause serious complications, such as kidney damage and even amputation. DM requires long-term treatment because diabetes is a chronic and complex disease that will be suffered with for life, where optimal blood sugar management is the main focus of treatment (Lathifah, 2017).

Given the negative impact of diabetes, appropriate interventions are needed to manage it. Approaches that can be taken include pharmacological therapy (through the administration of drugs) and non-pharmacological therapy, one of which is the use of herbal therapy. The WHO also recommends the use of herbal therapy as a complementary treatment, both to maintain health and to prevent and treat chronic and degenerative diseases (Susilawati, Cahyaningrum, & Wiryanatha, 2021; Dewi, Supriyadi, & Cita, 2022).

In general, the use of traditional medicines is considered safer than modern medicines (Pramiastuti, Listina, Alquraisi, & Nandayani, 2020; Dewi et al., 2022). In 2003, the Food and Drug Supervisory Agency (BPOM) and the Ministry of Health stated that turmeric leaves are considered to have health benefits (Sumartini & Susila, 2023). Turmeric leaves contain bioactive compounds such as flavonoids, tannins, and saponins, which are believed to have the potential to help lower blood glucose levels through a mechanism of increasing insulin sensitivity and providing a protective effect on pancreatic cells (Marton, Pescinini-e-Salzedas, Camargo, Barbalho, Haber, Sinatora, Detregiachi, Girio, Buchaim, & Cincotto dos Santos Bueno, 2021).

The use of *Curcuma longa* is beneficial for the treatment of DM. Curcumin content in *Curcuma longa* is reported to be able to prevent complications in DM. Based on interviews at the Trucuk Klaten Community Health Centre, none of the DM patients there knew that turmeric leaves could help lower blood sugar levels in DM patients, and scientific research proving the clinical effectiveness of turmeric leaf decoction, especially in DM patients, is still very limited and has not been studied in depth, so further research is needed (Silva, Arawwawala, Kumari, & Galappatthy, 2021).

RESEARCH METHOD

This study employed a quasi-experimental research design with a pretest–posttest approach and a comparison group. The design included two separate groups: an intervention group and a control group, each consisting of 30 participants diagnosed with Diabetes Mellitus. Although randomization was not conducted, the use of a control group allowed comparison and strengthened the evaluation of treatment effects over time.

The research was implemented in the working area of the Trucuk I Klaten Community Health Centre, located in Mandong Village, Klaten Regency, Central Java. Data collection and intervention procedures were carried out over a period of three months, from June to August 2025. Participant recruitment was performed using purposive sampling based on predetermined inclusion criteria, including being diagnosed with Diabetes Mellitus and actively registered at the community health centre.

Prior to intervention, baseline measurements of fasting blood glucose (GDS) levels were taken using a calibrated digital glucometer. Participants were then assigned to their respective groups. The intervention group received turmeric leaf decoction twice daily—once in the morning and once in the evening—for a continuous duration of one month. The decoction was prepared according to a standardized recipe and dosage, ensuring consistency throughout the intervention period. Participants were instructed to consume the decoction under routine supervision and were regularly monitored for adherence. Meanwhile, the control group did not receive any herbal preparation or additional treatment outside of their usual medical care.

Following completion of the 30-day intervention period, blood glucose levels were measured again using the same procedures and instruments to ensure comparability. All measurements were documented on structured observation forms prepared by the research team.

Before taking part in the study, all participants were provided with a thorough explanation of the research aims, procedures, potential benefits, and risks. Written informed consent was obtained from every participant to ensure ethical participation. The research protocol received ethical approval from the Health Research Ethics Committee of Muhammadiyah University of Purwokert, with approval number KEPK/UMP/176/VI/2025, indicating compliance with ethical standards for research involving human subjects.

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DOI: <https://doi.org/10.33024/minh.v8i11.1626>

RESEARCH RESULTS

Table 1. Characteristic of Participant (N=60)

Variable	Group	
	Control (n=30)	Intervention (n=30)
Age (Mean±SD)(Range)(Year)	(58.53±9.12)(43-70)	(59.37±7.84)(45-68)
Gender (n/%)		
Male	8/26.7	11/36.7
Female	22/73.3	19/63.3
Duration of Illness (n/%)		
< 10 years	18/60	21/70
>10 years	12/40	9/30
Diet (n/%)		
No Diet	19/63.3	18/60
Diet	11/36.7	12/40
Physical Activity (n/%)		
No activity	17/56.7	10/33.3
Activity	13/43.3	20/66.7

Based on Table 1, the characteristics of respondents by gender show that the majority are female, with 22 respondents (73.3%) in the control group and 19 respondents (63.3%) in the intervention group. Based on the age of the respondents, the control group ranged from 43 to 70 years old, and the intervention group ranged from 45 to 68 years old, with a mean and standard deviation of (58.53±9.12) for the control group and a mean and standard deviation of (59.37±7.84) for the intervention group.

Most respondents in the control and intervention groups had suffered from DM for <10 years, with 18 respondents (60%) in the control group and 21 respondents (70%) in the intervention group. Regarding diet, most respondents in the control group did not diet, with 19 respondents (63.3%), while 18 respondents (60%) in the intervention group did diet. Most respondents in the control group did not engage in physical activity (17 respondents, 56.7%), while most respondents in the intervention group did engage in physical activity (20 respondents, 66.7%).

Table 2. Normality Test Results

Blood Glucose	Shapiro-Wilk		
	Statistic	Df	Sig
Pre-control	0.843	30	0.001
Pre-Intervention	0.871	30	0.002
Post Control	0.894	30	0.006
Post Intervention	0.774	30	0.001

Based on Table 2, the Shapiro-Wilk normality test results show that the data distribution is not normal, with pre-control significance values of 0.001 and pre-intervention significance values of 0.002, which are smaller than 0.05, while the post-control normality test values of 0.006 and post-intervention values of 0.001 are also smaller than 0.05. Therefore, the bivariate test uses the Mann-Whitney U test.

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Table 3. Mann-Whitney U Test

Blood Glucose	Pretest (Mean±SD)	Posttest (Mean±SD)	p-value
Control	237.57±28.19	227.13±17.89	0.073
Intervention	258.07±43.38	197.23±45.77	0.001

Based on Table 3, the analysis results show that the p-value for the control group is 0.073, which means there is no difference in blood sugar levels in the first and second measurements. Meanwhile, in the intervention group, the p-value is 0.001, which means there is a difference in blood sugar levels before and after consuming turmeric leaf decoction.

Table 4. Analysis of the Difference in Mean Blood Sugar Levels (N=60)

Blood sugar	Mean±SD	p-value
Control	227.13±17.89	0.001
Intervention	197.23±45.77	

Based on table 4, the results of the analysis of the difference in blood sugar levels between the control and intervention groups showed a p-value of 0.001 ($p < 0.005$). This indicates that there was a significant effect between the control group and the intervention group that was given turmeric leaf decoction for 30 days.

DISCUSSION

This study found that the characteristics of respondents based on gender showed that the majority were female, with 22 respondents (73.3%) in the control group and 19 respondents (63.3%) in the intervention group. Women tend to have higher dietary patterns than men. This is due to the high pressure of their roles, the habit of consuming snacks, and special conditions such as pregnancy and breastfeeding.

In addition, mothers with toddlers often tend to finish their children's leftovers, which affects their food intake, unlike men, who generally do not experience similar situations, thereby affecting glucose levels and triggering DM. Women are at greater risk of developing type 2 diabetes due to their daily activities and lifestyle (Kurniasari, Sari, & Warmi, 2020; Gunawan & Rahmawati, 2021).

Another factor that makes women more prone to diabetes than men is the decrease in estrogen and progesterone hormones during menopause, as these hormones enhance insulin response in the blood,

which helps regulate blood glucose levels (Arania, Triwahyuni, Esfandiari, & Nugraha, 2021).

The results of the study on the characteristics of respondents based on age showed that the control group was aged 43-70 years, and the intervention group was aged 45-68 years. The results of this study showed that the average age of patients with DM was 40 years, which is a transitional stage that marks the onset of ageing symptoms. At this phase, a decline in the body's physiological functions begins to appear, which can lead to various diseases. At this stage, there is a decline in the function of all body systems, including the immune and metabolic systems. The endocrine, sexual and reproductive, cardiovascular, gastrointestinal, muscular, and nervous systems experience a decline in function. Degenerative diseases begin to be diagnosed, and activity and quality of life decline due to significant impairments in physical and mental abilities. The results show that DM occurs in people aged 40-60 years (Takeda, Angioni, Setphan, Macaron, Barreto, Sourd, Sierra, & Vellas, 2020).

The results of the study on the characteristics of respondents based on dietary patterns showed that most of the control group did not diet, with 19 respondents (63.3%), while the intervention group had 18 respondents (60%). Dietary patterns are a way to regulate the type and amount of food consumed to maintain health, maintain nutritional status, and help prevent the onset of diseases,

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especially diabetes mellitus. People with diabetes mellitus need to understand the importance of managing their daily diet, which ideally consists of three main meals and three snacks. Around 45% of respondents experience hyperglycemia, caused by consuming foods high in sugar, which can trigger diabetes mellitus (Wahyuni, 2019).

A diet high in sugar, fat, and salt has a significant relationship with blood sugar levels in people with diabetes. Therefore, it is important for respondents to be able to regulate their diet and maintain regular meal times so that blood sugar levels remain stable. The importance of diet in managing diabetes to avoid complications that can lead to death (Majid, Bashet, Siddique, & Rahman, 2019; Eltrikanawati & Tampubolon, 2020).

The results of the study on the characteristics of respondents based on physical activity showed that most of the control group did not engage in physical activity, with 17 respondents (56.7%), while most of the intervention group engaged in physical activity, with 20 respondents (66.7%). Physical activity or exercise is one of the pillars in DM management that functions to improve insulin sensitivity and also to maintain physical fitness. Physical exercise can help glucose enter cells without requiring insulin. In addition, physical exercise can also reduce the weight of obese diabetics and prevent the progression of glucose tolerance disorders to DM. Conversely, if DM patients do not engage in physical activity, glucose production will routinely increase by 3-4 times more than usual, along with an increase in glucagon, which causes hyperglycemia in diabetes mellitus patients (Ekasari & Dhanny, 2022).

Most diabetic patients engage in moderate activities such as sweeping, mopping, and washing clothes, with respondents averaging 30 minutes of physical activity per day. Lack of physical activity can affect the body's metabolic processes, leading to fat accumulation that triggers diseases, including diabetes mellitus (Amrullah, 2020).

Based on the research results, the average blood glucose levels of the control group at the beginning (pretest) were 237.57 mg/dl. After 30 days (posttest), the blood glucose levels of the control group were reassessed, yielding a value of 227.13 mg/dl. The blood glucose levels in the intervention group before consuming turmeric leaf decoction (pretest) were 258 mg/dl, while the average blood glucose levels of

respondents after consuming turmeric leaf decoction for 30 days decreased to 197.23 mg/dl.

The use of *Curcuma longa* is beneficial for the treatment of diabetes mellitus. Curcumin, a flavonoid contained in *Curcuma longa*, has been reported to be able to prevent complications in diabetes mellitus. Turmeric leaves (*Curcuma domestica* Val.) are known to have antidiabetic activity because they contain various secondary metabolites such as flavonoids, tannins, glycosides, and steroids. Flavonoids play a role in lowering blood glucose levels by increasing insulin sensitivity, stimulating insulin secretion, inhibiting the α -glucosidase enzyme, and increasing glucose absorption in skeletal muscle and adipose tissue (Silva et al., 2021).

In addition, flavonoids can also protect pancreatic β cells from damage caused by oxidative stress, thereby helping to regenerate pancreatic cells and improve insulin production. Tannins work by increasing glucose absorption through the activation of insulin signalling pathways, GLUT-4 translocation, and have an astringent effect on the intestines that can reduce excess glucose absorption. This mechanism synergistically supports the reduction of blood glucose levels, so turmeric leaf extract can be categorised as a natural antidiabetic agent (Yan & Asmah, 2010).

The results of this study found that before being given turmeric leaf decoction, the average glucose level in the control group was 237.57 mg/dl and in the intervention group was 258 mg/dl. Looking at the average blood sugar levels before treatment in both groups, it was found that the difference in blood sugar levels was not significant and still fell within the category of diabetes mellitus.

Meanwhile, after administering turmeric leaf decoction to the intervention group, the average blood glucose level was 197 mg/dl, compared to 258 mg/dl before administering turmeric leaf decoction. These data show a significant decrease in blood sugar levels of 61 mg/dl.

Based on the analysis results, the p-value for the control group was 0.073, indicating no difference in blood glucose levels between the first and second measurements. Meanwhile, in the intervention group, the p-value was 0.001, indicating a difference in blood sugar levels before and after consuming turmeric leaf decoction. This shows that turmeric leaf

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decoction affects lowering blood sugar levels in diabetic patients with a p-value of 0.001 ($p < 0.005$).

Turmeric leaves contain bioactive compounds such as flavonoids, tannins, and saponins, which are believed to have the potential to help lower blood glucose levels. This can be used as a non-pharmacological supportive therapy in the treatment of diabetes mellitus in addition to medical treatment. The WHO also recommends the use of herbal therapy as a complementary treatment, both for maintaining health and preventing and treating chronic and degenerative diseases.

In general, the use of traditional medicine is considered safer than modern medicine. In 2003, the Food and Drug Supervisory Agency (BPOM) and the Ministry of Health stated that turmeric leaves are considered to have health benefits (13). Turmeric leaves contain bioactive compounds such as flavonoids, tannins, and saponins, which are believed to have the potential to help lower blood glucose levels through mechanisms that enhance insulin sensitivity and provide protective effects on pancreatic cells (Pramiastuti et al., 2020; Dewi et al., 2022).

CONCLUSION

Based on the analysis, the administration of turmeric leaf decoction has an effect on lowering blood glucose levels in diabetic patients. This non-pharmacological therapy using turmeric leaf decoction can be utilised as supportive therapy for diabetic patients due to its bioactive compounds, such as flavonoids, tannins, and saponins, which are believed to have the potential to help lower blood glucose levels.

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