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Moringa leaf tea as an antihyperglycemic alternative of type 2 diabetes mellitus in the elderly

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Abstract

Background: Type 2 diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia due to insulin resistance or decreased insulin secretion. Herbal complementary therapies are increasingly in demand as an alternative to managing blood sugar levels. However, studies of its effectiveness as a single therapy in the elderly have not been widely researched.
Purpose: To evaluate the effectiveness of moringa leaf tea as an antihyperglycemic alternative in elderly patients with type 2 diabetes mellitus.
Method: A case report study conducted on one participant to evaluate the effect of moringa leaf tea on fasting blood sugar levels in elderly people with type 2 Diabetes Mellitus (DM). This approach was chosen to document individual responses to herbal interventions in actual clinical conditions and provide an in-depth picture of changes in blood sugar levels after intervention. The patient in this study was a 61-year-old woman who had been diagnosed with type 2 DM for one year and was not taking antihyperglycemic drugs. The participant had a history of non-compliance with pharmacological therapy due to previously felt side effects.
Results: Before the intervention, the patient reported experiencing typical symptoms of hyperglycemia, such as frequent thirst, increased urination frequency especially at night, and fatigue that interfered with daily activities. Blood sugar levels were measured before the intervention, and were found to be 256 mg/dL, indicating hyperglycemia. After consuming moringa leaf tea 3 times a day for three consecutive days, blood sugar levels decreased and on the 3rd day it was 220 mg/dL. In addition, the patient also reported improvements in clinical symptoms, such as reduced thirst, increased urination frequency especially at night, and increased energy.
Conclusion: Consumption of Moringa leaf tea can lower blood sugar levels in elderly people with type 2 diabetes mellitus without antidiabetic drugs. In addition, improvements in clinical symptoms such as reduced thirst, urination frequency, and increased energy were also observed.
Suggestion: Further studies are needed with larger samples and longer intervention periods to evaluate its long-term efficacy and safety. In addition, this study can explore more deeply the molecular mechanisms associated with the antihyperglycemic effects of Moringa leaves and its potential in natural therapy-based diabetes management strategies.

Keywords: Alternative Therapy; Antihyperglycemic; Elderly; Moringa Leaf Tea; Type 2 Diabetes Mellitus.

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INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia due to insulin deficiency or resistance. Type 2 DM is the most common disease, accounting for about 90% of DM cases worldwide (Ahmad, Lim, Lamptey, Webb, & Davies, 2022). In 2017, about 6.28% of the world's population suffered from this disease, or about 6059 cases per 100,000 population. This prevalence is predicted to increase in 2030 to 7,079 cases per 100,000 (Khan, Hashim, King, Govender, Mustafa, & Al Kaabi, 2020). In Indonesia, the prevalence of DM continues to increase, with the incidence rate reaching 1.5% or more than one million people (Ministry of Health of Republic of Indonesia, 2018). This condition demands effective management strategies to control blood sugar levels to prevent further complications. Various approaches have been used in DM management. However, complementary therapeutic approaches, such as herbal plants, are gaining attention due to their ease of access, lower cost, and minimal side effects (Putri & Yuniarti, 2023; Setiyorini, Qomaruddin, Wibisono, Juwariah, Setyowati, Wulandari, & Sari, 2022).

One plant that has antidiabetic potential is moringa leaves (*Moringa oleifera*), which contain bioactive compounds such as flavonoids and polyphenols that are known to have hypoglycemic effects (Ahmad, Khan, & Blundell, 2019; Nova, Redondo-Useros, Martínez-García,Gómez-Martínez, Díaz-Prieto, & Marcos, 2020). Several previous studies have shown that consuming moringa leaf tea can lower blood glucose levels in patients with type 2 DM, making it an enjoyable therapeutic alternative.

Various studies have been conducted regarding the benefits of moringa leaves in lowering blood sugar levels. However, there is still a gap in the literature regarding optimal dosage, specific mechanisms of action, and effectiveness compared to conventional pharmacological therapies (Gul, Khan, Li, & Liu, 2025). Most existing studies used different methods and durations of interventions, making it difficult to compare the results directly (Nova et al., 2020). In addition, most studies still focus on the broader population without considering the specific characteristics of older groups with more complex metabolic conditions (Yun, Kim, Ahn, Han, & Ko, 2024). Older adults often experience a more significant decrease in insulin sensitivity than other age groups, so more research is needed to evaluate the effectiveness of moringa leaf tea in this context (Umegaki, 2024). Further, few studies directly examine the impact of moringa leaf tea consumption in controlled clinical scenarios, especially in individual case studies that highlight patient-specific responses to herbal interventions.

This study was conducted on elderly people with type 2 diabetes at the Serang Health Center, Banten to evaluate the effectiveness of giving Moringa leaf tea for three days in reducing fasting blood sugar levels. The results of this study are expected to provide a basis for the application of herbal therapy in the treatment of type 2 DM in the elderly and add insight into individual approaches to alternative therapies. In addition, these findings can contribute to the development of evidence-based clinical recommendations for integrating herbal medicine into the primary health care system.

RESEARCH METHOD

A case report study conducted on one participant to evaluate the effect of moringa leaf tea on fasting blood sugar levels in elderly people with type 2 Diabetes Mellitus (DM). This approach was chosen to document individual responses to herbal interventions in actual clinical conditions and provide an in-depth picture of changes in blood sugar levels after intervention. The participant in this study was a 61-year-old woman who had been diagnosed with type 2 DM for one year and was not taking antihyperglycemic drugs. The participant had a history of non-compliance with pharmacological therapy due to previously felt side effects.

The participant was given an intervention of consuming moringa leaf tea 3 times a day with a dose

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of 150 ml per consumption for three consecutive days. Moringa leaf tea is made by boiling 300 mg of dried moringa leaves in 450 ml of water for 15 minutes, then filtered before consumption. Tea is drunk one hour before meals to optimize its effect on blood glucose levels. This procedure was adapted from previous studies showing the antihyperglycemic potential of Moringa leaves (Ayobami, Kade, Oladimeji, Kehinde, & Gurpreet, 2020; Mthiyane, Dludla, Ziqubu, Mthembu, Muvhulawa, Hlengwa, & Mazibuko-Mbeje, 2022).

Random blood sugar levels were measured using a calibrated standard glucometer. Measurements were taken before and after the intervention (on the first, second, and third days). In addition, observations of the subjective conditions of the patient, including levels of fatigue, thirst, and frequency of urination, were also carried out as additional indicators of the effectiveness of the intervention. Additional data were obtained through interviews with patient to document their subjective experiences during the intervention.

RESEARCH RESULTS

Table 1. Characteristics of Participant

Variables	Results
Demographic Data	
Age (Years)	61
Gender	Female
Occupation	Unemployed
Last Education	Junior high school
Physical Examination	
Blood pressure (mmHg)	140/90
Pulse (times/minutes)	90
Respiratory rate (times/minutes)	20
Random blood sugar (RBS) (mg/dL)	256
Height (cm)	155
Weight (kg)	65
Patient History	
Recent History	The patient had been feeling weak for the past three days, so that daily activities were reduced and he rested more. The patient also experienced frequent urination, especially at night (3-4 times a night), and often felt thirsty after consuming excessive sweet drinks (es campur) the day before. Two days earlier the patient had been treated at the Health Center and the results showed that blood sugar levels had increased to 256 mg/dL. The patient was prescribed glibenclamide 10 mg once a day but did not take it.

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Variables	Results
Previous History of Illness	A year ago, the patient was diagnosed with type 2 DM. Patients were given glibenclamide 10 mg, but experienced side effects such as cold sweats, chest palpitations, and even near fainting. From then on, the patient decided not to take antidiabetic drugs. The patient decided to control his blood sugar levels by simply maintaining a diet.
Social History	The patient is a housewife. Daily living needs depend on the husband's pension fund. Her children were married and did not live in the same house as her.
Nursing Problem Identified	
Subjective	Weakness, frequent urination, frequent drinking, lack of appetite, impaired activity.
Objective	Weakness, thirsty appearance, dry mouth, random blood sugar 256 mg/dL.

The participant in this study was a 61-year-old woman who had been diagnosed with type 2 Diabetes Mellitus (DM) for one year. Before the intervention, the participant reported experiencing typical symptoms of hyperglycemia, such as frequent thirst, increased urination, especially at night, and fatigue that affected daily activities. Blood sugar levels were measured before the intervention, and were found to be 256 mg/dL, indicating hyperglycemia.

Table 2. Therapy Management

Variables	Day-1	Day-2	Day-3
Complaints	Weak, dry tongue, and thirst.	Weak, dry tongue, and thirst.	Reduce complaints of weak, dry tongue, and thirst.
Side effects (palpitation, sweating, dizziness)	No	No	No
Random Blood Sugar (RBS)(mg/dL)	245	232	220

Table 2 shows the therapy management, after consuming moringa leaf tea 3 times a day for three consecutive days, blood sugar levels decreased at all times. On the 3rd day, blood sugar levels decreased to 220 mg/dL. In addition, the patient also reported improvements in clinical symptoms, such as reduced thirst, frequency of urination especially at night, and increased energy, so that the patient could return to activities better. The patient did not experience significant side effects while consuming moringa leaf

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tea. No signs of hypoglycemia were found, such as dizziness, cold sweats, or excessive weakness. In addition, moringa leaf tea is easy to consume and does not cause discomfort.

DISCUSSION

This study showed that administering moringa leaf tea without chemical drugs for three days reduced blood sugar levels in elderly participants with type 2 DM. Before the intervention, participants' RBS levels were recorded at 256 mg/dL, which indicated hyperglycemia. After consuming moringa leaf tea three times a day, blood sugar levels dropped to 220 mg/dL. In addition, participants also reported improvements in clinical symptoms, such as reduced thirst, decreased urination frequency, especially at night, and increased energy that supports daily activities.

Participants were DM sufferers who dropped out of treatment due to side effects of antidiabetic drugs. The national survey data 2018 reported that 10.8% of the age group of 55-64 years did not comply with diabetes treatment (Ministry of Health of the Republic of Indonesia, 2018). In addition, because most of this age group is no longer productive at work, they choose other treatment alternatives that are considered cheaper and more comfortable (Yun et al., 2024).

Along with the increase in the age group of the elderly, degenerative diseases such as type 2 diabetes are also increasing. Global data reports that people with type 2 diabetes over 50 are 37% compared to other age groups, which are only 4.4% (Khan et al., 2019; Putri & Pujiyanto, 2025). Older adults have specific physiological characteristics, including increased susceptibility to various health conditions and the risk of drug side effects due to diverse drug use (Umegaki, 2024; Yun et al., 2024). Therefore, alternative therapies, such as herbal remedies with fewer side effects, are increasingly being considered in the blood sugar control of elderly patients with DM (Setiyorini et al., 2022).

Several clinical studies have been reported on the antidiabetic effects of moringa leaf tea. A study in Palu City, Indonesia, in the form of giving moringa leaf tea as much as 3 x 250 ml to 4 weeks (28 days) as much as 3 cups per day one hour before meals with an average compliance rate of 99.5% can reduce fasting blood sugar (GDP) levels by 13.42 mg/dL (Mujianti & Sukmawati, 2018). Another similar study also reported that moringa leaf tea could lower blood sugar levels if given 3 times a day for 3 days in the elderly with Type 2 DM, so according to the study, this herbal treatment can be applied as an effort to control and lower blood sugar levels as well as a companion to antihyperglycemic drugs (Nurrochimah, 2018). Previous research also showed that giving Moringa leaf tea brewed with 200 ml of water had a significant impact on reducing blood glucose levels in type 2 diabetes sufferers in the intervention group compared to the control group with a p value <0.05 (p value 0.01) (Rofianti & Septiani, 2022).

In addition to moringa, several other plants have been reported to have antihyperglycemic effects. These plants include cinnamon, bitter melon, fig-trees, African oil palm leaves, and apples (Setiyorini et al., 2022). However, the antihyperglycemic effects of these plants are not as sound as moringa leaves. Cinnamon extract is reported to lower GDP by up to 9.8 mg/dL, while palm extract can lower GDP by up to 7.7 mg/dL (Risnawati & Demmalewa, 2022; Setiyorini et al., 2022; Syamhadi, Kalanjati, Abdurachman, Prasetiowati, Aditya, Pamungkas, & Nasution, 2024).

Blood glucose levels depend on the balance between the body's glucose use, food intake, and endogenous sugar production. Glucose in the blood comes from 3 sources, namely carbohydrate absorption, glycogenolysis (breakdown of sugar stores in the body), and gluconeogenesis (formation of glucose from body fat stores). After eating, the body will absorb glucose. At the same time, endogenous glucose production (glycolysis and gluconeogenesis) will be suppressed, while glucose use and storage by the liver, muscles, and fat tissue will increase (Alsahli & Gerich, 2014; Nakrani, Wineland, & Anjum, 2020).

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Moringa leaves work to lower blood sugar levels through several physiological carbohydrate pathways. Moringa leaves contain active compounds such as flavonoids and polyphenols that can inhibit the activity of digestive enzymes that can reduce gluconeogenesis in the liver, reduce glucose absorption from the intestines, increase insulin secretion and increase tissue sensitivity to insulin (Ahmad et al., 2019).

Polyphenols, especially epigallocatechin-3-gallate (EGCG), have been reported as the main bioactive in moringa that has antihyperglycemic effects. In the small intestine, EGCG effectively reduces glucose absorption by up to 48% due to its interaction with glucose transporters in the small intestine (SGLT1 and GLUT2). In addition, EGCG also interacts with GLUT2 in the liver. GLUT2 in the liver functions in various endogenous glucose supply mechanisms, such as glycolysis, gluconeogenesis, and glycogenolysis. Gluconeogenesis (formation of glucose from non-carbohydrate sources) is the main source of increased glucose production by the liver. This mechanism is closely related to the ability of insulin to regulate gluconeogenic enzymes, namely phosphoenolpyruvate carboxykinase (PEPCK) and glucose-6 phosphatase (G6Pase). In this mechanism, insulin-mimetic EGCG inhibits gluconeogenesis in the liver so that endogenous glucose levels can be suppressed (Liu, Lv, Pan, Jiang, Zhu, & Zhang, 2022).

In addition, the antioxidant content in moringa leaves is also known to reduce oxidative stress, contributing to the progression of type 2 DM (Omodanisi, Aboua, & Oguntibeju, 2017). Beta-carotene in vitamin A is an antioxidant that protects the body from free radical attacks and diseases. Ascorbic acid in vitamin C helps the secretion process of the hormone insulin and vitamin E, which helps prevent the deterioration of organ function (Gul et al., 2025).

Reduced clinical symptoms, patients feel, and the absence of perceived side effects can improve adherence to therapy. This result is one of the other advantages of herbal therapies such as moringa leaf tea compared to chemical therapy.

Although the results of this study provide positive indications regarding the effectiveness of moringa leaf tea in lowering blood sugar levels, several limitations need to be considered. First, this study is a case report with only one participant, so the results cannot be generalized to a wider population. Further studies with a larger sample size are needed to confirm these findings. Second, the short intervention duration of three days limits understanding of the long-term effects of moringa leaf tea consumption in regulating blood sugar levels. Therefore, studies with a longer intervention period are needed to evaluate the sustainability of the hypoglycemic effects of moringa leaves in managing type 2 DM.

In addition, compliance and tolerance to moringa leaf tea consumption are factors that need to be further explored. In this study, participants reported that moringa leaf tea was easy to consume and did not cause significant side effects. However, studies with a more diverse sample group are needed to assess potential side effects in individuals with different medical conditions. Overall, this study provides preliminary evidence that moringa leaf tea may contribute to lowering blood sugar levels in elderly people with type 2 DM. However, further studies with better designs are needed to confirm the effectiveness and safety of moringa leaf tea as a complementary and alternative therapy in managing type 2 DM.

CONCLUSION

Consumption of moringa leaf tea for three days can reduce blood sugar levels in elderly people with type 2 diabetes mellitus from 256 mg/dL to 220 mg/dL without antidiabetic drugs. In addition, improvements in clinical symptoms such as reduced thirst, urinary frequency, and increased energy were also observed.

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SUGGESTION

Further studies are needed with larger samples and longer intervention periods to evaluate its long-term efficacy and safety. In addition, this study can explore more deeply the molecular mechanisms associated with the antihyperglycemic effects of Moringa leaves and its potential in natural therapy-based diabetes management strategies.

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