

The Effect of Moringa (*Moringa oleifera*) Leaf Juice on Blood Sugar Levels in Type II Diabetes Mellitus Outpatients at Babah Buloh Public Health Center, North Aceh District

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Abstract

Diabetes mellitus is characterized by elevated blood glucose levels that exceed the normal range. In addition to pharmacological treatment, blood sugar levels in individuals with diabetes can also be managed using herbal therapies. One such alternative is Moringa (*Moringa oleifera*) leaf juice, which contains various bioactive compounds such as flavonoids, beta-carotene, thiamine, riboflavin, vitamin C, calcium, and zinc—many of which possess antidiabetic properties and are believed to be effective in lowering blood glucose levels. This study aimed to determine the effect of Moringa leaf juice on blood sugar levels among type II diabetes mellitus outpatients in the working area of Babah Buloh Public Health Center, North Aceh District. A quasi-experimental study was conducted using a pretest–posttest control group design from December 7 to 14, 2024. The intervention lasted for seven consecutive days, during which blood glucose levels were measured using the Easy Touch glucometer. Data were analyzed using paired *t*-tests and independent *t*-tests. The results showed that in the intervention group, the average blood sugar level decreased from 182.1 mg/dL to 166.3 mg/dL, with a mean reduction of 15.7 mg/dL. In the control group, levels decreased from 177.8 mg/dL to 170.5 mg/dL, with a mean reduction of 6.7 mg/dL. These findings indicate that Moringa leaf juice had a significant effect on reducing blood sugar levels in type II diabetes mellitus patients in the Babah Buloh Health Center working area in 2024. It is recommended that Moringa leaf juice be considered as a complementary therapy for managing blood glucose levels in diabetic patients.

Keywords: blood sugar levels, moringa leaf juice, type II diabetes mellitus

Introduction

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels beyond the normal range. It has emerged as a major global health concern, with diabetes-related mortality continuing to rise across various regions of the world. A deficiency or resistance to insulin may result in chronic hyperglycemia, which, if left untreated, can lead to multi-organ complications. Type II diabetes mellitus typically develops due to insulin resistance, rather than an absolute lack of insulin (Novianty et al., 2023).

Chronic hyperglycemia in type II diabetes mellitus often persists for a prolonged period before diagnosis. This condition can trigger oxidative stress, which disrupts the activity of antioxidant enzymes, both of which contribute to endothelial dysfunction and complications associated with diabetes (Putri & Waluyo, 2019). The high prevalence of diabetes has significant economic implications, increasing healthcare costs and reducing quality of life and productivity. This, in turn, affects individuals' capacity to work effectively and may lead to reduced income and diminished socioeconomic well-being (Harefa & Lingga, 2023).

According to WHO (2023), approximately 422 million people worldwide are living with diabetes, with an estimated 1.5 million diabetes-related deaths annually. The International Diabetes Federation (IDF), as cited by the Indonesian Ministry of Health (2020), reported that 463 million people globally were living with diabetes in 2020, a number expected to rise to 700 million by 2045. Indonesia ranks third among countries with the highest prevalence, at 11.3%. According to *Riskesdas* (2018), the prevalence of diabetes diagnosed by a doctor in individuals aged ≥ 15 years increased from 1.5% in 2013 to 2.0% in 2018, with the highest prevalence found in individuals aged 55–64 years (6.3%) and 65–74 years (6.0%). In urban areas, the prevalence was 1.9%, compared to 1.0% in rural areas (*Riskesdas*, 2018).

In Aceh, the Provincial Health Office reported 184,527 cases of diabetes mellitus in 2021, of which only 53% (97,131 individuals) received adequate healthcare services. In North Aceh District, diabetes prevalence continues to increase, with 12,207 reported cases in 2022 (*Profilkes Aceh*, 2024). In the working area of Puskesmas Babah Buloh, 324 diabetes mellitus cases were reported in 2023, with an average of 16 cases per village. Contributing risk factors included gender, genetics, obesity, and poor dietary habits (Puskesmas Babah Buloh, 2023). Risk factors for type II diabetes mellitus are classified as modifiable—such as overweight (high BMI), physical inactivity, central obesity, dyslipidemia, high sugar intake, low carbohydrate and fiber intake, and smoking—and non-modifiable, such as age, gender, ethnicity, family history of diabetes, and a history of delivering a baby weighing more than 4,000 grams (Amalliah et al., 2024).

Effective management of diabetes requires continuous treatment to maintain glycemic control through both **pharmacological** and **non-pharmacological** strategies. Pharmacological treatment typically includes oral hypoglycemic agents and insulin injections. Meanwhile, non-pharmacological approaches may include the use of locally sourced herbal ingredients such as **Moringa (*Moringa oleifera*) leaves** (Rindarwati et al., 2023). Moringa has been studied extensively for its nutritional and medicinal properties and is known to contain bioactive compounds—including flavonoids, alkaloids, and glucosinolates—that exhibit antidiabetic effects by inhibiting alpha-glucosidase activity. These compounds delay the breakdown of complex carbohydrates in the small intestine, thereby reducing postprandial glucose absorption and contributing to improved blood sugar regulation (Safitri et al., 2023).

Moringa leaves are rich in antioxidants such as vitamins A, C, and E, and flavonoids, which help neutralize free radicals and reduce oxidative stress associated with diabetes (Halan et al., 2019). While Moringa leaves are traditionally consumed as boiled water or vegetables, innovations such as Moringa leaf juice—enhanced with honey and lemon—can improve palatability and promote consumption as part of a functional local food product. Moringa is readily available in local

communities, as it is commonly grown in household gardens. Packaging Moringa juice in labeled plastic bottles enhances its appeal and convenience for consumers.

Based on the significance of this issue and the potential role of Moringa leaf juice in supporting blood sugar control, this study was conducted under the title: **"The Effect of Moringa (*Moringa oleifera*) Leaf Juice on Blood Sugar Levels in Type II Diabetes Mellitus Outpatients at Babah Buloh Public Health Center, North Aceh District."**

Methods

This study aimed to examine the effect of Moringa (*Moringa oleifera*) leaf juice on blood glucose levels in patients with type II diabetes mellitus. A quasi-experimental design with a pretest–posttest control group was employed. The study was conducted from December 7 to 14, 2024, in the working area of Puskesmas Babah Buloh, North Aceh Regency. Participants were divided into two groups: the intervention group, which received 200 ml of Moringa leaf juice daily for seven consecutive days, and the control group, which received 200 ml of water. The population consisted of 71 individuals aged 17–65 years diagnosed with type II diabetes mellitus. A total sampling method was used, but only 40 participants who met the inclusion criteria were enrolled—20 in each group. The study began with baseline blood glucose measurement by medical personnel. The intervention was administered between 08:00 and 10:30 AM each day for a period of seven consecutive days. On the 8th day, blood glucose levels were remeasured to assess changes. Data underwent editing, coding, processing, tabulation, and cleaning. Dependent and independent t-tests were used to analyze differences within and between groups. Results were presented in both tabular and narrative formats.

Result

Blood sugar levels before and after in the intervention and control groups

Table 1. Blood Sugar Levels Before and After in Intervention and Control Groups

Blood Sugar Level (mg/dL)	Groups							
	Intervention				Control			
	Mean	Min	Max	SD	Mean	Min	Max	SD
Before	182.1	160	200	13.8	177.8	149	198	16.2
After	166.3	114	198	18.1	170.5	146	198	15.9

The mean blood sugar level in the intervention group decreased from 182.1 mg/dL before treatment to 166.3 mg/dL after receiving Moringa leaf juice. In the control group, which received only water, the mean blood sugar level also decreased slightly from 177.8 mg/dL to 170.5 mg/dL. These results suggest a greater reduction in blood sugar levels among participants who consumed Moringa leaf juice compared to those in the control group.

Differences in Blood Sugar Levels before and after the administration of Moringa Leaf Juice and Water on Blood Sugar Levels

Table 2. Dependent T-Test Results

Mean Blood Sugar Level (mg/dL)	SD	Mean difference	t	p-value
Intervention groups				

Before	182.1	13.8	15.7	3.8	.001
After	166.3	18.1			
Control groups					
Before	177.8	16.2	7.2	6.7	.000
After	170.5	15.9			

The results of the dependent t-test showed that in the intervention group, the p-value (Sig. 2-tailed) was 0.001, which is less than the significance level of 0.05. This indicates that the decrease in blood sugar levels before and after the administration of Moringa leaf juice was statistically significant. The mean blood sugar level dropped from 182.1 mg/dL to 166.3 mg/dL, with an average reduction of 15.7 mg/dL. In the control group, the p-value was 0.000, also below the 0.05 threshold, indicating a statistically significant decrease in blood sugar levels after consuming water. The mean decreased from 177.8 mg/dL to 170.5 mg/dL, with an average reduction of 6.7 mg/dL. These results suggest that both interventions led to significant reductions in blood sugar levels; however, the reduction was more pronounced in the group receiving Moringa leaf juice.

Differences in the Effect of Moringa Leaf Juice on Blood Sugar Levels in Intervention and Control Groups

Table 3. Independent T-Test Results

Groups		N	Mean	Std. Deviation	Mean Difference	p-value
Blood sugar levels	Intervention	20	166.3 mg/dL	18.1	- 4.2	.000
	Control	20	170.5 mg/dL			

The results of the independent sample t-test, conducted on 40 respondents, show a mean difference of -4.2 mg/dL between the intervention and control groups. The negative value indicates that the mean blood sugar level in the intervention group (after consuming Moringa leaf juice) was lower than that in the control group. In this context, the negative difference simply reflects the direction of comparison and not a negative outcome. The p-value was 0.000 (< 0.05), indicating a statistically significant difference in blood glucose levels between the intervention and control groups after treatment. The intervention group had an average blood glucose level of 166.3 mg/dL, while the control group had a higher average of 170.5 mg/dL. These findings confirm that Moringa leaf juice had a significant effect in reducing blood sugar levels in type II diabetes mellitus patients in the Babah Buloh Health Center working area, North Aceh.

Discussion

This study utilized Moringa (*Moringa oleifera*) leaves as the primary ingredient in juice preparation. Moringa leaves, which are widely recognized for their nutritional content and health benefits, contain essential nutrients such as amino acids and antioxidants (Yohandini et al., 2024). In the study area, Moringa is well-known and widely available, supported by dry tropical climate conditions that are conducive to its optimal growth. The juice was prepared using leaves from the third to sixth stalks, as these are known to have a high concentration of bioactive

compounds. A total of 100 grams of fresh Moringa leaves were used for each juice preparation, a portion that contains approximately 51.66 grams of carbohydrates, 4.65 grams of fat, and 22.7 grams of protein.

The dependent t-test results showed a significant reduction in blood glucose levels in the intervention group, with a p-value of 0.000 ($p < 0.05$), indicating a statistically significant effect. The mean blood glucose level decreased from 182.1 mg/dL to 166.3 mg/dL, representing an average reduction of 15.7 mg/dL. In contrast, the control group, which received only water, experienced a smaller but statistically significant decrease in blood glucose, from 177.8 mg/dL to 170.5 mg/dL (a reduction of 6.7 mg/dL).

This outcome supports the conclusion that Moringa leaf juice significantly lowers blood glucose levels in patients with type II diabetes mellitus. The reduction may be attributed to the high content of flavonoids in Moringa leaves. One hundred grams of Moringa leaves are reported to contain approximately 473 mg of flavonoids, which are known to reduce oxidative stress by scavenging free radicals. Reduced oxidative stress contributes to improved insulin sensitivity and helps protect pancreatic β -cells from damage. Moreover, flavonoids may inhibit intestinal glucose absorption and reduce its reabsorption into the bloodstream, thereby lowering overall blood glucose levels (Halan et al., 2019).

The antidiabetic properties of Moringa leaves are closely associated with their rich nutritional profile, which includes beta-carotene, thiamine, riboflavin, vitamin C, calcium, iron, magnesium, phosphorus, potassium, and zinc. These nutrients exert synergistic effects in managing diabetes. For instance, beta-carotene supports glucose regulation, antioxidants promote cellular repair, vitamin C enhances insulin function, and ascorbic acid contributes to insulin secretion.

Previous studies have yielded mixed but generally supportive results. A study by Halan et al. (2019) reported no significant change in blood glucose levels after administering 100 ml of Moringa leaf juice (110.1 mg/dL before and 110.3 mg/dL after). However, Waruwu et al. (2022) observed a reduction from 170 mg/dL to 155 mg/dL following the administration of 200 ml of Moringa leaf decoction. Similarly, Age (2021) reported a substantial reduction from 230.8 mg/dL to 159.4 mg/dL after administering 150 ml of Moringa decoction, indicating an average decrease of 71.4 mg/dL. These findings reinforce the potential of Moringa leaves as a complementary therapy in blood glucose management.

Conclusion

There was a significant effect observed in both the intervention and control groups following the administration of Moringa leaf juice on blood sugar levels among patients with type II diabetes mellitus in the Babah Buloh Health Center Working Area, North Aceh Regency, in 2024. It is recommended that future research expand upon these findings by exploring the influence of additional variables—such as physical activity levels, dietary patterns, obesity status, and stress levels—to identify the most significant contributing factors in lowering blood glucose levels.

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